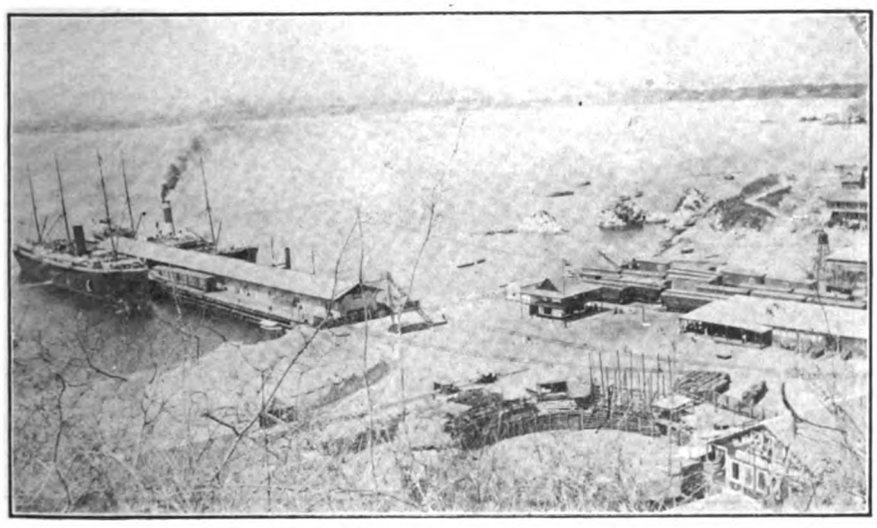
THE MARINE REVIEW

VOL. 40. CLEVELAND, SEPTEMBER, 1910. NEW YORK No. 9

PORT OF MANZANILLO

By M. L. Gilmore.

ALTHOUGH Mexico lies contiguous to the United States, it is less accurately known than its importance warrants. It is a land of striking contrasts and with an artistic and intellectual past, and it possesses a character and an individuality peculiarly interesting. It is comparatively easy of access and in point of picturesqueness and historical interest it has few equals.



Manzanillo Harbor, Showing Wharf and Railroad Terminal.

With a coast line of 1,600 miles on the Gulf of Mexico and the Caribbean Sea and 2,800 miles on the Pacific, Mexico has no less than 24 ports on the Gulf of Mexico and 31 on the Pacific ocean. Most of the natural harbors of Mexico are on the Pacific side, among them the splendid bay of Acapulco, considered one of the most beautiful bays of the world. The following Pacific ports are ports of entry open to foreign trade: Acapulco, Altata, Bahia de la Magdalena, Guaymas, La Paz, Mazatlan, Puerto Angel, San Blas, San Jose del Cabo, Salina Cruz, Santa Rosalia, Todos los Santos, Tonala, San Benito, and Manzanillo.

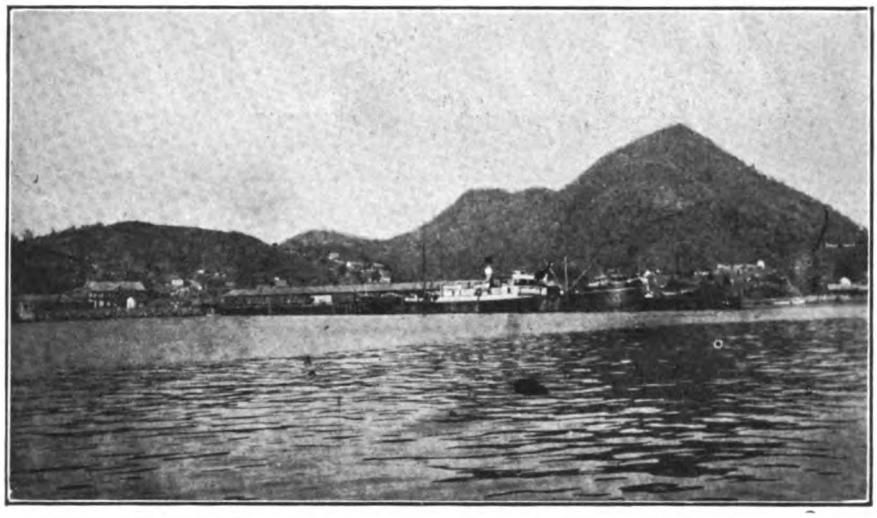
Mexico may be reached from the sea by several lines, either from New York or the Gulf ports of the United States, or via San Francisco or one of the numerous lines plying between European and Mexican ports. On the Pacific side, the Pacific Mail Steamship Co., the Pacific Coast Steamship Co., and the Kosmos Line provide means of communication, the Pacific Mail sailing regularly every ten days from San Francisco, calling at Mazatlan, San Blas, Acapulco, Salina Cruz, and Manzanillo. The Pacific Coast Steamship Co.'s vessels leave San Francisco on the seventh day of each month, calling at Ensenada, Magdalena Bay, San Juan Del Cabo, Mazatlan, Altata, La Paz, Topolomampo, Santa Rosalia, and Guaymas. The steamers of the Kosmos Line sail from San Francisco every two or three weeks and call at Mazatlan, San Blas, Acapulco, Salina Cruz, Tonala, San Benito, and Manzanillo. Several lines of steamers maintain a regular coastwise service between the different ports of Mexico, the most important of these being the Campania Naviera del Pacifico, which is subsidized by the Mexican government.

The rivers of Mexico, although numerous and some of them of considerable length, afford but scanty means of navigation, due to their small volume of water and the fact that they are apt to rise suddenly during the rainy season and fall rapidly during the dry season. The Rio Grande, the Lerma, the Rio Panuco, and the Rio de las Balsas are navigable for short distances only.

The three largest ports on the western coast of Mexico are, Guaymas, Mazatlan, Acapulco and Salina Cruz. Next in importance and destined to be one of the most extensive western ports is the port of Manzanillo, the Pacific coast port of the National Railroads of Mexico.

On Dec. 12, 1908, President Diaz

formally opened the new railroad from Guadalajara to Manzanillo. The rail communication established between Guadalajara and Colima and thence over the line already in operation to Manzanillo gave Mexico a second transcontinental railway connecting the two oceans. As a result, Colima, a small but richly resourceful section of the country, is provided with an Atlantic outlet for its products and the Pacific port of Manzanillo has become an important harbor. The export of native products, including hats, rice, and sugar, is rapidly growing and large shipments of wheat are being received from North Pacific ports. The steamship lines connecting from China and Japan with Manzanillo as a port of entry, now receive much of the merchandise that formerly was forwarded overland from Tampico.

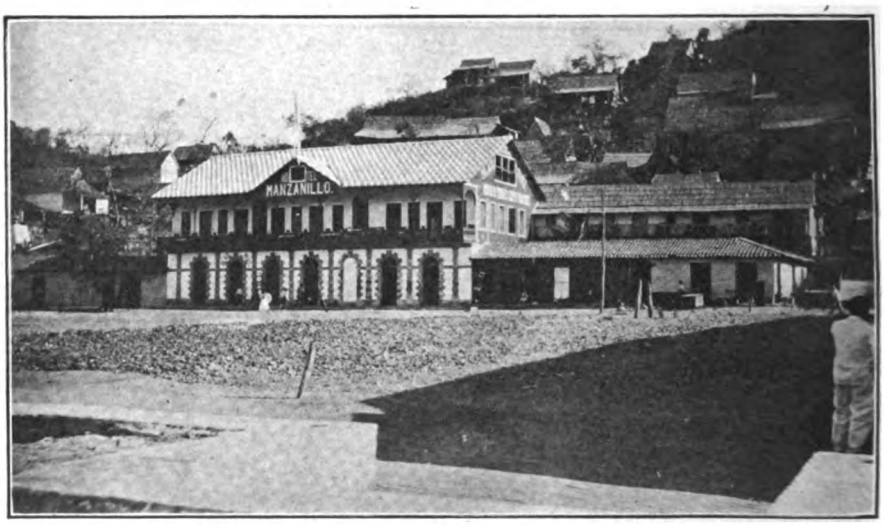


A SECTION OF MANZANILLO, SHOWING LOCATION OF WHARF.

Manzanillo is one of the oldest and most celebrated ports of the republic. Herman Cortes built a number of ships in the port in 1525. Before it had railroad connection, Manzanillo was a port of considerable note. Through here many of the gold seekers passed to and from California in 1849 and 1850. Government roads extended from the boundary of Louisiana purchase territory to Manzanillo, offering a shorter route than by sailing vessels around the horn. Manzanillo lies almost due west of the city of Mexico, 500 miles south of Mazatlan, 900 miles north of Salina Cruz, and 400 miles north of Acapulco. It stands at the extreme western point of the long narrow ridge of land that separates the ocean from the Laguna de Cuyutlan. This lagoon is 9.3 miles long by 8.82 miles wide, and is filled with green brackish salt water which is very shallow at all times and during certain seasons of little rainfall dries up entirely.

When the port works which have been under construction since 1899 are finished, it will be one of the best equipped and most desirable ports on the coast. The Mexican government has spent over 8,000,000 pesos within the last few years improving the harbor facilities, getting it ready for the commerce that is coming to it following the opening of the railroads. Manzanillo bay opens out directly on the Pacific ocean and the long open stretches of water comprising Santiago and Manzanillo bays offer little or no protection from the northwesterly winds and ocean swells. To provide secure and protected anchorage, the government began, in 1900, the construction of an unusually massive breakwater from the outer point north and east curving toward the sand bars surrounding San Pedrito lagoon. This breakwater contains about 1,500,000 tons of blue granite from the Colima quarries and is one of the largest in the world, rivaling in size those of Cherbourg, France, and Plymouth, England. It is 1,446 ft. long, 600 ft. of which stands in water 60 ft. deep. This wall has a width of 300 ft. at the bottom and is topped by a cement crown, 25 ft. wide and 16 ft. thick. The body of the work is built of granite blocks, some of which weigh 50 to 60 tons. On the seaboard side, it is protected by blocks weighing 30 tons and on the inner side by smaller ones ranging from 3 to 15 tons in weight. Further extension of the breakwater will, when finished, provide a protected harbor area of 165 acres with a uniform depth of about 39 ft., enabling it to accommodate sea-going vessels of deep draught.

The port work development involves the dredging of the harbor immediately below the town, where a bottom of coral reefs and sand extends entirely around the bay. This originally provided very poor anchorage except in deep water. On a line from Point San Pedrito to Point Chiquita del Viejo, a depth of six fathoms prevails and the depth increases rapidly outside of this. Outside of the coral reefs extending around the bay along the sand shores, there is a depth of five to six fathoms. Seawalls built at the edge have been backed up by the material removed by dredging, giving interior seawalls aggregating 2,600 ft. in length. The dredging work is being done by Col. Smoot. Due to the nature of the soil, dipper dredges and grab buckets are used to bring up the material. Then it is dumped into a trough and water pumped through to carry it ashore to fill in back of the walls. Tides vary from 2 to 4 ft., the greatest difference being 5 ft. Currents come from alongshore for the most part and average one-half to one and one-half knots per hour.



HOTEL MANZANILLO, A TYPICAL BUILDING IN MANZANILLO.

Although the government is doing the

harbor improvement work, the National Railroads of Mexico own the terminals and wharves. The docks are built at right angles to the shore line and are one-story sheds, built of corrugated iron on a wooden wharf. The railroad terminals are directly above with the switching yards, terminals and stations arranged in parallels. Ships are piloted in from the breakwater by a harbor pilot, but come in under their own power and are anchored head out at the wharves.

A great difference is noticeable by an American in the methods employed in handling cargoes from the ships in unloading. A large amount of wheat is shipped to Manzanillo from north Pacific coast points. Wheat is brought out of the holds in slings by the ships' winches and transferred to a raised platform, the top of which is about as high as a peon's shoulder. Wheat in sacks is for the most part carried on peons' shoulders directly into the cars. Peons comprise most of the native labor. They get "$1.00 Mex." per day, which is 50 cents in gold, for day shifts, and "$1.50 Mex." or 75 cents in gold for night shifts. Native labor is so cheap that it is more economical to handle freight in this way than by any system of mechanical conveyors.

This little port, with 1,500 inhabitants and no dry docks or repair facilities at the present time, is destined through its location to become one of the large seaports of the west Mexican coast. The mineral wealth of Mexico in silver, gold, copper and lead is proverbial. Extensive forests abound in hard woods, dye woods and medicinal plants. Coffee, tobacco, cocoa and sugar are beginning to be exported in large quantities. Back of these raw materials and opportunities is the corporation, known as the "National Railways of Mexico," which is a consolidation of the Mexican Central and Mexican National Railways, capitalized at $230,000,000. The Mexican government holds $115,002,290 worth of shares, which is a majority of the capital stock and makes the government the deciding factor for development.

Port Dues for Manzanillo, Mexico.

Pilotage—$9.00 Mexican ($4.50 gold).

Dockage, outside harbor, nothing.

Port dues—1½ cents per ton Mexican (¾ cent gold).

Gross for all Mexican ports, payable at first Mexican port, where vessel calls. No other dues for other subsequent ports of call.

Hospital dues—½ cent per ton gross, Mexican (¼ cent gold), at each Mexican port of call.

American bill of health—$2.50 gold.

Water—1 cent per gallon Mexican (½ cent gold).

Ordinary ship supplies are obtainable. Water is all brought from mountains, 40 miles inland.

Mexican laborers on board ship have the following schedule:

Day:—

6 a. m. to 11 a. m.

1 p. m. to 5:30 p. m.

$1.00 per shift Mexican (50 cents gold).

Night:—

7 p. m. to 12 p. m.

1 a. m. to 5:30 a. m.

$1.50 per shift Mexican (75 cents gold).

Ordinary labor, $20 to $25 per month Mexican ($10.00 to $12.50 gold).

An Atlantic Motor Liner

AN arrangement has been entered into between the Hamburg-American Steamship Co. and the Standard Oil Co., for an adequate supply of liquid fuel in consequence of the fact that the Hamburg-American Co. has decided to build a 9,000-ton Atlantic liner, which will be driven by motor. The order for this new type of cargo vessel has been given to Messrs. Blohm & Voss, Hamburg.

The enormous saving of space both below and on deck, will be of material moment to a freight carrier of the type it has been decided to build. The two great motors to be employed in propelling the ship are of the Drexel type each with three cylinders, which at 120 to 150 r. p. m. are to develop some 1,500 h. p. each, and one immediate advantage is the economy amounting to 75 per cent, which will be effected in engine room space, thus giving so much the more cargo accommodation. Another economy is the smallness of the engine room staff, only three engineers and three oilers being required for both motors in watches of eight hours each. For fuel, petroleum residue will be employed. In Germany, it can be bought for $2 per ton, and in America—one of the terminals of the voyage—it is considerably cheaper. The whole cost is considered to be about 75 per cent less than coal. The vessel's screws are somewhat smaller than those usually allotted to craft of 9,000 tons, making up to 150 r. p. m., but it is expected that a speed of about 12½ knots will be obtained. Whilst ordinary steamers can only convert about 16 per cent of fuel consumed into energy, a motor-driven vessel converts 30 per cent. The new steamer, which will be completed in 12 or 14 months, is intended for the Hamburg and New York and Philadelphia trade.

The engines will be rather similar in appearance to the ordinary vertical steam engines. The gear is most simple, the valves being operated by a few very short levers. Every valve can be changed in a couple of minutes, and all parts are as easily accessible as can be desired.

The simplicity of the reversing gear can never be matched by a steam engine. Regulation of revolutions and reversing will be done by a small hand wheel. The propeller, of course, is coupled directly with the engine thus ensuring easy handling, the same as with steam engines. For lubrication the circular system of stationary engines has been adopted. The stresses of the different parts of the machinery are kept within very low limits, and are subject to the control of the British and German Lloyd. The consumption of fuel will come to some 200 grams per h. p. per hour. The engine room of the vessel will present quite a novel aspect, the more so as the auxiliary engines will also show the latest improvements of technical progress. The absence of funnels will even externally point out the novelty of this new type of vessel, which is to be built entirely, hull and engines, by the Germans.

The enormous impetus that it is expected will be given to the development of oil fuel as a motive power for large steamers will have far reaching results in the near future. The experiment will undoubtedly be watched with the keenest interest the world over.

A Notable Non-Stop Run

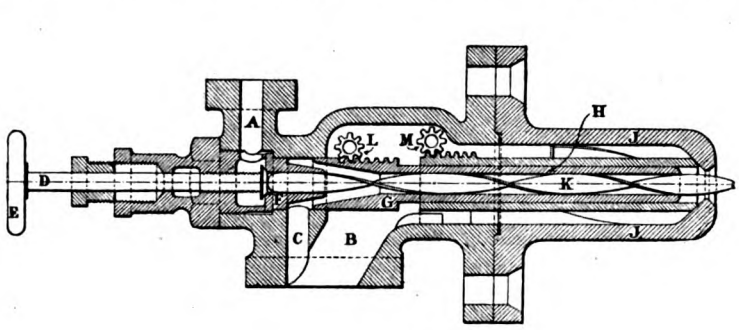
The steamship Waimate has recently completed a remarkable run between the Clyde and Vancouver, B. C., via Cape Horn. The vessel, which is owned by the Union Co., of New Zealand, steamed the whole 15,000 miles without ever stopping her engines, completing the voyage in 62 days at an average speed of 11½ knots. This is believed to be a world's record. Several instances are on record of American ships, covering the voyage between Atlantic coast ports and the Pacific coast without stopping engines, but the distance between Great Britain and the Pacific coast is, of course, much greater. There are a number of instances also of ships having made the run between Britain and Australia and New Zealand via the Cape of Good Hope without stopping, but this also is a shorter course than that covered by the Waimate.

IMPROVEMENTS IN LIQUID FUEL APPARATUS

Oil Fuel Making Headway in the Navy and Mercantile Marine

BRITISH marine interests have awakened to the advantages of oil fuel. What has, in large measure, contributed to this change is, in the first place, the success that has attended the British admiralty experiments with the Kermode burner which has been previously described in THE MARINE REVIEW, and also the recent developments in oil which give promise that before long a world-wide area of supply of fuel oil will be available. The investigations as to the best methods of using oil fuel have also brought to light many points in its favor. While the practical use of oil fuel in ships of war has justified the admiralty in equipping the latest battleships, cruisers and destroyers for its use and in ordering a supply of 32,000,000 gallons of the fuel, it is interesting to note that the British naval authorities have been influenced in their present attitude towards oil fuel in addition to the favorable investigations carried out by the Unted States navy, by the successful experiments made on board the British destroyer Surly with the Kermode burner.

The advantages of oil over coal as a fuel on board ship have been demonstrated in the facility with which the bunkers can be filled and the furnaces automatically fed, the saving of space, the quickness and ease with which steam can be raised and maintained, and the higher average speed obtainable in consequence, the smokeless combustion, even at high speeds, and in the cleanliness and comparative cheapness of oil fuel, considering the advantages gained. All these points are of vital importance in the matter of naval efficiency, as the admiralty authorities now fully realize. All the newer battleships and cruisers, including the Dreadnought class, have been fitted for burning oil as well as coal, and many older vessels, originally designed to use coal only, and which would to that extent have been obsolete, have also been fitted with oil fuel apparatus at small cost. For cruising in time of peace coal is used, but in maneuvering, or when on a war footing, the oil burners are turned on. The use of oil fuel reduces the displacement of a ship compared with that of a coal-fired ship of the same power. A man-of-war equipped with oil-fuel becomes more mobile than one dependent solely on coal. The exhaustion of stokers, the burning down and cleaning of fires necessitated by the use of coal, the depositing of soot in the boiler tubes, representing loss of power, all are obviated by liquid fuel, and, moreover, fewer stokers are needed. Oil fuel, therefore, is a necessity in the battle line.



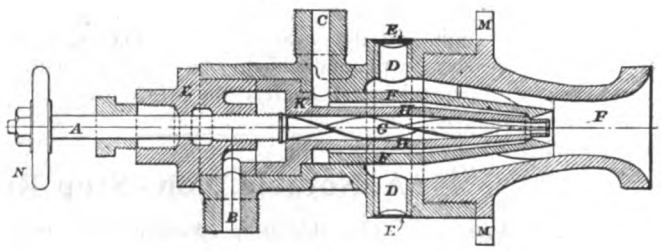
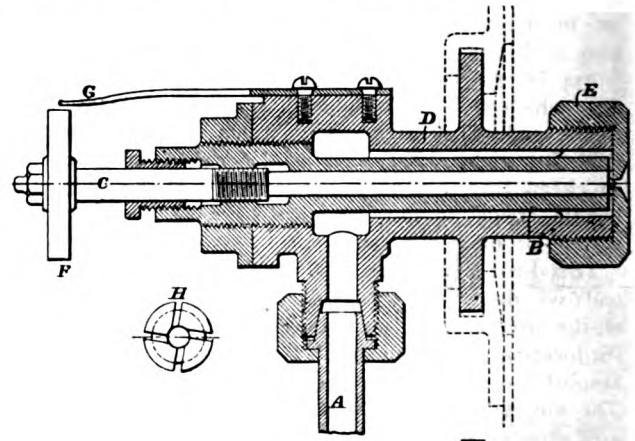


FIG. 1—AIR JET BURNER.
FIG. 2—STEAM AND AIR JET BURNER.



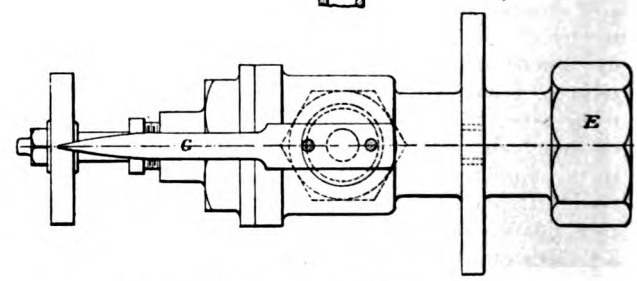


FIG. 3—PRESSURE JET BURNER

Ocean Liners and Oil Fuel.

At present a number of mail and cargo vessels on the Pacific coast of North and South America and between California and Japan, and most of the trading steamers in the Dutch East Indies use oil fuel, as well as the ships of the Anglo-American Oil Co., carrying oil to Europe. Some remarkable steaming feats have been achieved by oil-driven vessels. For instance, the boats owned by the Shell Transport Co. have for years voyaged

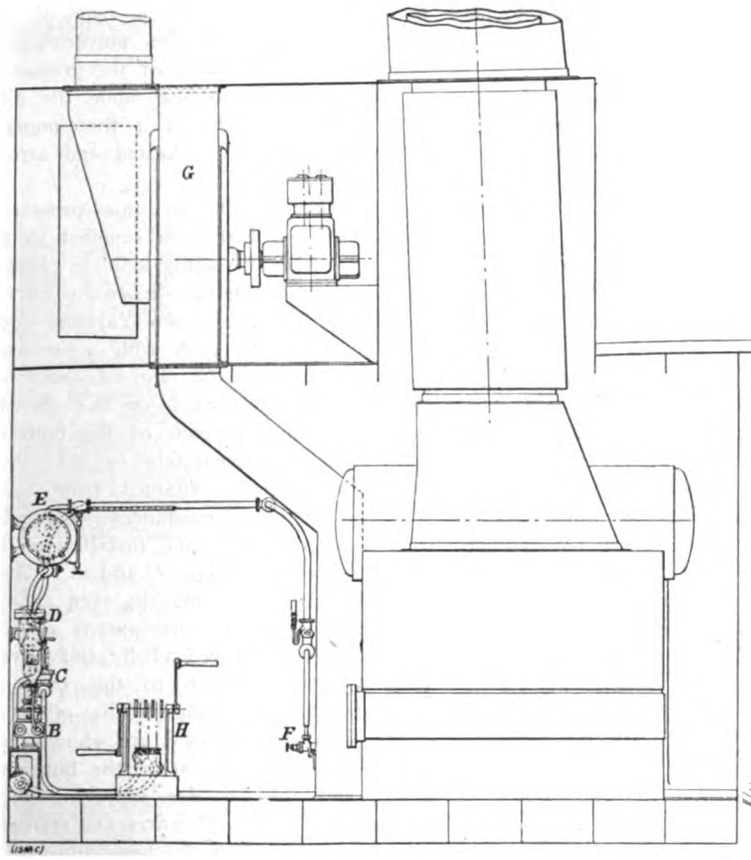


FIG. 4.

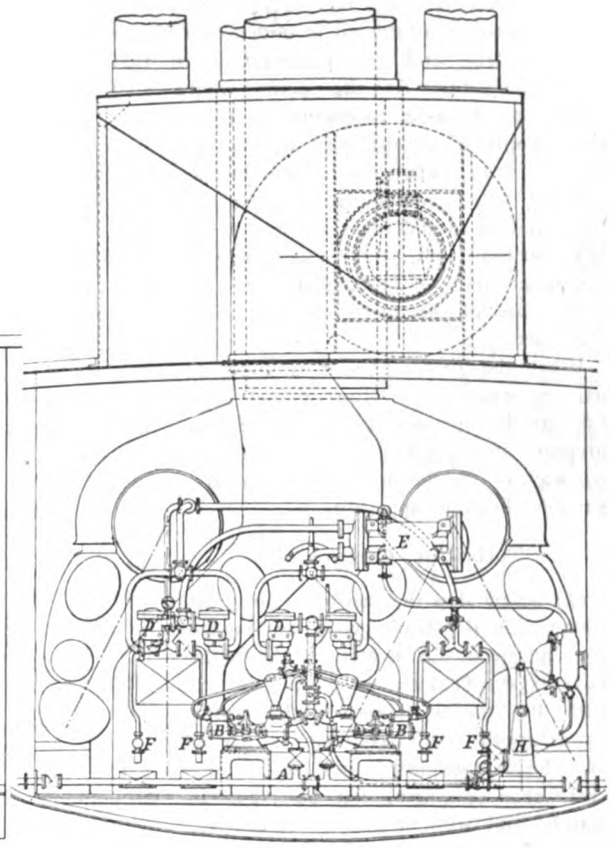


FIG. 5.

direct from Singapore to London, via the Cape, a distance of nearly 12,000 miles, without rebunkering, which would be impossible with coal. The North German Lloyd steamer Tanglin was fitted for both fuels, and on a trip to Sydney, used an average of 13 tons of oil per day as against 20 tons of coal. The relative prices at Singapore were $7.20 per ton for oil, and $6 for coal; the daily expenditure, therefore amounted to $93.60 for oil, and $120 for coal, besides maintaining an average speed with oil of 11½ knots, an increase of one knot per hour compared with coal, while only one man per watch was required in the stokehold instead of five with coal. About 350 tons of oil were bunkered at Singapore in 45 minutes. The extra freight that might be earned can be formed by multiplying the deadweight difference between oil and coal for daily consumption, by the days on voyage. So far none of the great Atlantic lines have adopted liquid fuel although the latest liners have been so constructed that they can be readily adapted to the use of oil. On the Mauretania and Lusitania for example, 5,500 tons of coal are consumed between Liverpool and New York, or 11,000 tons for the round trip for a speed of 25 knots. Six hundred tons of oil would accomplish as much as the 1,000 tons of coal now used every 24 hours, about 2,000 less fuel on a five days run, or 4,000 tons on the round trip. Of the 312 firemen and coal passers now employed on each ship, 285 might be dispensed with, and 27 oilers would be able to attend to both the oil burners and feed water. About 200 third-class passengers at $25 each could be berthed by altering the accommodation reserved for the 285 firemen and trimmers. It is estimated that even with coal at $4.40 per ton, as against oil at $9 per ton on the eastward voyage, and $16.25 westward, the increased earning capacity with oil fuel would be about $19,400 from New York to Liverpool, and $9,400 from Liverpool to New York. A full supply of oil could be put aboard in three hours, compared with 20 hours for coal. Moreover cleaning fires and irregular coal stoking is responsible in some cases for 10 per cent loss of steam thoroughout a voyage, while experience on other ships justifies the belief that the use of oil fuel would reduce the voyage between Queenstown and New York by eight or ten hours.

New Type of Burner.

A new type of the Kermode liquid fuel plant has been designed in which the burners are of the air-jet type, and can be used with low pressure superheated steam, in case the supply of compressed air should fail. One of them is shown in longitudinal section in Fig. 1, from which the action will be understood. The oil enters at the branch *A* after which its flow is regulated by the conical valve on the spindle *D*. After being heated by its passage through a suitable apparatus placed in the hot gases from the boiler, the air enters the branches *B* and *C*, the portion entering through *C* meets the oil as it passes the conical control-valve, which is operated by the wheel *E*, and the oil and air travel on together, the former being rapidly vaporized in its passage. In order to assist this process there is a helix *K* placed in the central tube which effects a complete admixture of the air and vapor. The supply of air can be regulated at two points by means of the pinions and racks shown. One of these pinions, marked *L*, moves the internal tube over the oil-delivering nozzle *F*, and so regulates the air which enters there. The second pinion *M* operates the other tube and varies the amount of air escaping round the mixed jet at the end

of the helix *K*. By this arrangement the combustion of the oil is under complete control, and the vaporization is very complete. At the point where combustion is about to commence a further supply of compressed air is given, and a third supply is added by the draught which comes through the fire-bars, and in special cases through a hollow furnace-front, and passes between the inner and the outer plates, and escapes through a coned opening round the burner.

When the air-compressor is under repair or examination, the oil-fuel burners can be operated by means of low-pressure steam, which is superheated on its way to the burners by means of a suitable heating apparatus.

Turbo-Air Compressor.

On board ship the use of a turbo air-compressor is advantageous, as it makes for lightness and neatness. A further advantage of this system lies in the fact that no alteration of the boilers, as arranged for coal-firing, is needed, and the change fom liquid fuel to solid fuel, or vice versa, can be made instantly, and without loss of steam pressure. It is claimed that the air-compressor absorbs less than 2 per cent of the steam raised, and this steam is condensed and returned to the boilers as hot feed.

The steam jet burner is shown in longitudinal section in Fig. 2. The oil enters the burner through the branch *B*, and has a whirling motion given to it by the prolonged spiral stem of the valve spindle *G*, the amount of oil being governed by the hand-wheel *N* at the end of the spindle *A*. The steam enters at *C* around the hollow cone *H* and passes through slots (not shown) in the cylindrical portion of this cone, where it fits the inside of the hollow air-cone *F*. It will be seen that in this way all the oil passing through the burner is steam-jacketed. The air-cone *F* is also fitted with spiral guides, and the air is drawn past these guides through the openings *D* by the inductive action of the steam. The amount of air passing may be regulated by means of the movable perforated strap *E*. On the front portion of the burner is the part marked *F*, which is so arranged that it can be screwed in or out as a whole, being turned by the spider *M*. When moved, it carries with it the cone *F*, and in so doing regulates the space between this and the oil-cone *H* for the escape of the steam. As the range of adjustment is large, the same burner may be used for different powers within wide limits. When the burner is started, the steam opening is first adjusted by trial, which is done by unscrewing the front of the burner, so that the space between the cone *H* and that marked *F* allows the minimum amount of steam required for atomization to pass through. The amount of opening for induced air is readily determined by the character of the flame and the sound of the fire when in operation. The flame should be transparent and of an intense white color or approaching pink when using light oils. The steam-jet burner may be operated by means of steam or air, and in the case of this burner, as well as that of the air-jet burner, no alteration of the furnace, as arranged for coal, is necessary. When oil is to be the only fuel used, however, there is no object in fitting fire-bars, and a suitable arrangement of brickwork is provided. It is claimed that the steam-jet system just described will recover from 68 to 74 per cent of the calorific value of the fuel used in actual work.

Pressure Jet Burner.

The latest type of Kermode burner brought out is the pressure-jet burner which has been specially designed for naval and other vessels, and it is recommended for use with forced or induced draught. The burner is shown in longitudinal section and in plan respectively in Fig. 3. The oil fuel enters the burner through the channel marked *A* in Fig. 3 and passes between the outer wall of the burner marked *D*, and the inner cylinder marked *B*, which abuts against the cap-nut *E*. The end of the cylinder *B* is an exact fit in the outer casing *D* where it abuts against the nut *E*, and in this end of *B* a number of grooves are cut parallel to the center line of the burner, while there are similar grooves in the end of the part *B* at right angles to the axis of the burner. These grooves are shown at *H* in Fig. 3, and it will be seen that they are tangential to the cone end of the spindle *C*, which serves to contract, or enlarge, the opening through the cap-nut *E*. The movement of *C* is indicated on the graduated wheel *F*.

By means of this arrangement the oil fuel is atomized very completely, by being forced through a restricted opening with a rotary motion, which is given to it by the tangential grooves in the face of the plug *B*, and it is distributed in the form of a cone by means of the reaction or deflection which is set up by the oil impinging on the cone end of the spindle *C*. The fixed pointer marked *G* serves to indicate the degree to which the wheel *F* has been rotated, either to increase or diminish the opening through the nut *E*. With this burner neither steam nor air is required to disintegrate the oil, the pulverization being effected by means of the pressure which is brought to bear upon the oil fuel itself by means of a force-pump. Before use, the oil is heated and carefully filtered.

A complete outfit of this pressure jet system has just been supplied to a steamer which is being built in Java, the installation being shown in Figs. 4 and 5. There are two Yarrow type water-tube boilers, each with a heating surface of 750 sq. ft. Forced draft is used, as may be noted, on the closed ashpit system, and each of the boilers can be worked separately so that the full power can be obtained from one boiler should circumstances demand. The arrangement of the installation is clearly shown in Figs. 4 and 5. The oil-fuel suction-pipes may be seen at *A*, Fig. 5, and the oil force-pumps at *B*, Fig. 4. *C* is a spring-loaded relief-valve with a return branch to the suction side of the force-pumps. The oil-fuel filters fitted in duplicate are shown at *D*, the oil-fuel heater at *E*, the burners at *F*, and the fan for supplying the forced draft at *G*. The fires are started initially by means of the hand-pump *H*.

The steam which is used for driving the oil force-pumps and for heating the fuel is condensed and returned to the feed-tank, so that no water is lost, as with the steam-jet system. It is claimed that with the pressure-jet system the saving of feed-water, the lightness of the equipment, and its immunity from breakdown through the duplication of force-pumps and filters are considerations which have decided its adoption for use on warships. This system is said to recover from 70 to 75 per cent of the calorific value of the fuel used in actual work.

Contract for Harbor Tugs

The Department of Docks and Ferries, of the City of Philadelphia, has awarded to the Waters-Colver Co., of West New Brighton, S. I., the contract for building two new tugs for use in Philadelphia harbor. One tug will be 81 ft. long, 20 ft. wide and 9 ft. depth of hold. The propelling machinery consists of a fore and aft compound engine with cylinders 12 in. and 26 in. by stroke of 18 in. The other tug will be 66 ft. long, 16 ft. wide and 17 ft. depth of hold, with propelling machinery consisting of a single high-pressure engine 14 in. by 14 in.

Contract for the enlargement of the naval dry dock at Norfolk, Va., has been awarded to William L. Miller, of Boston, for $523,784.

MOTOR BARGES OF THE CHESAPEAKE BAY

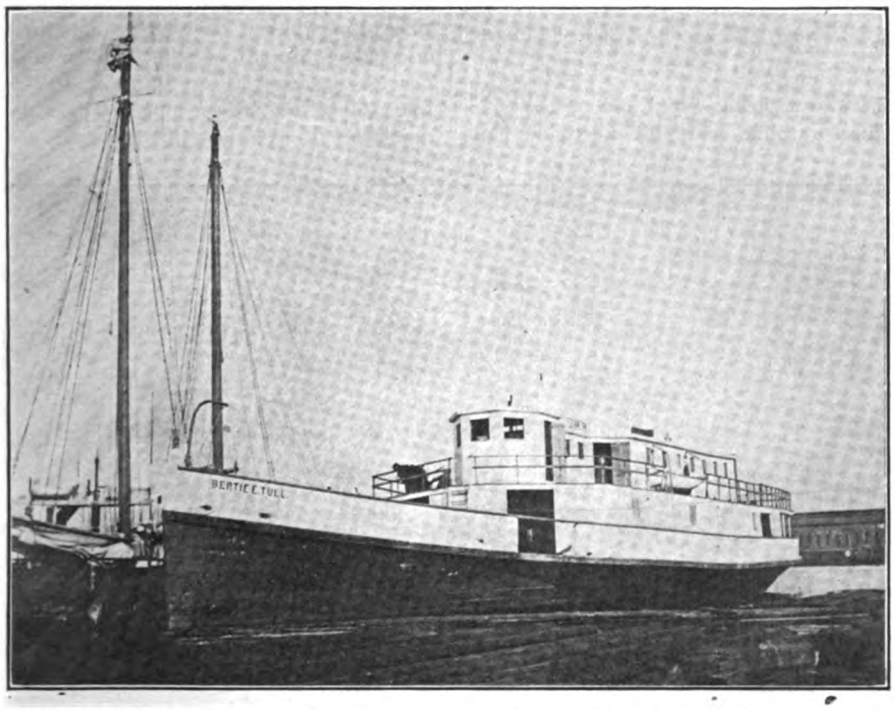
By Stuart Stevens Scott.

ON no body of water in this country has the woorking motor boat reached as high a development as on the Chesapeake Bay, that great inland sea that, with its numerous tributaries, penetrates deeply into the states of navigable water for light draught vessels.

Ever since the states of Maryland and Virginia have been settled the maritime interests have been large, especially those interests of the bay and great numbers of sailing craft that ply between Baltimore at the head of the bay and Norfolk at the foot, and the hundreds of steamers that run from the two cities named along routes leading up the various rivers and to the hundreds of wharves along their banks, made but small inroads upon the sailing craft that hauled lumber, cordwood, farm products and general merchandise.

During the past decade, however, there has been wrought an enormous change, a change so great that only those familiar with the conditions can appreciate it, and it has been brought about by the perfection of the internal combustion engine, a power so cheap and effective that it has not only almost entirely killed the industry of building sailing craft, but it has entered closely in competition with the river steamers, besides opening up entirely new sections of the tidewater counties to direct communication with the cities of Baltimore and Norfolk.

It is estimated that there are not less than 3,000 working boats of all classes on the Chesapeake carrying on commerce in all of its phases. From Baltimore alone there hails 84 documented power craft, most of which are working boats and their aggregate tonnage is 2,035 tons, gross. Of these, eighteen are of more than 15 tons each and they are engaged in freight and passenger work. Three of them haul passengers exclusively.



Bertie E. Tull, Largest Gasoline Boat on Chesapeake Bay.

These eighteen craft represent the largest gasoline boats on the bay and their combined tonnage is 1,079 tons, or more than one-half of the tonnage of the entire fleet of documented craft. To cite the tonnage of the boats that hail from Baltimore, however, is not altogether fair, for the majority of the power craft hail from many of the small tidewater towns—Annapolis, Crisfield, Cambridge, Oxford, Tappahannock, Cape Charles City, Hampton, Newport News and Portsmouth—where they are built or the closest town where their interests lie. For example, there is a shipyard at Madison, Md., that has turned out some excellent examples of the gasoline barge, some of which are of nearly 40 tons.

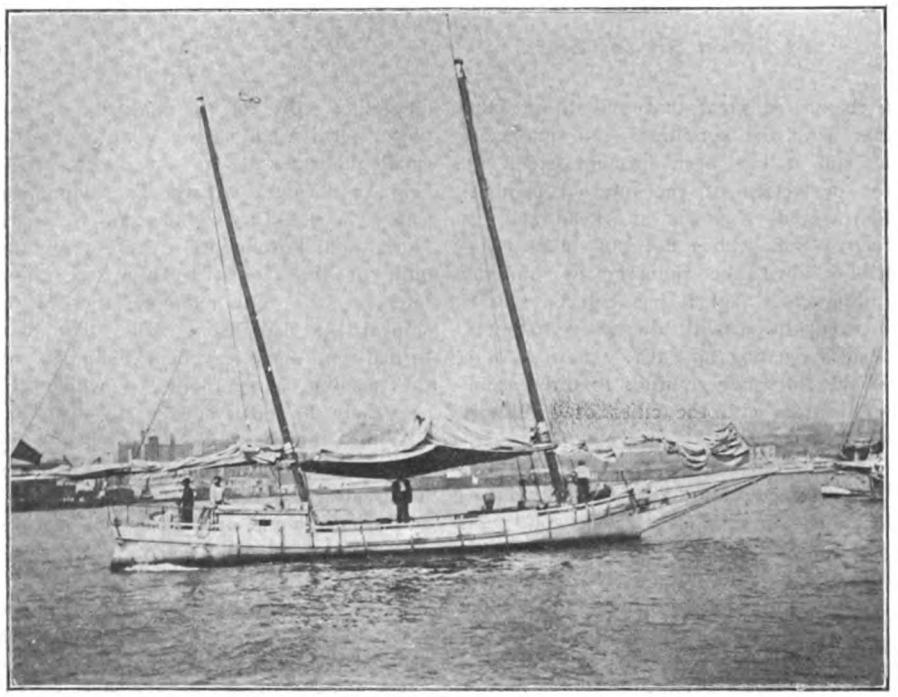
While the gasoline barge has been of vast benefit to general merchandising its greatest value has been to the farmers, whose lands are washed by creeks of a few feet depth. Many of these estuaries could not be navigated by a sailing vessel because of narrow channels. Likewise is the lack of water prohibitive to a steamer. With the gasoline barge, however, the streams afford ideal conditions. No longer does the farmer have to haul his produce to the nearest wharf, let it lie there until the steamer comes and perchance to perish in the interim. He either buys or builds a motor boat, or makes a deal with some of his neighbors, erects his own wharf on his own property, loads when it suits him and gets his vegetables and fruit to the market in time to command the maximum prices.

Scores of farmers in the tidewater counties own and operate their own motor boats, while there are several companies that operate motor barges on regular schedules, just as the steamers are, and they have all made money. Indeed, some of the general store keepers in the lower part of Maryland have found it advantageous to patronize these motor boat lines, getting their merchandise not only quicker by that means, but even cheaper freight, which counts considerable.

There are few states that have such a large number of men employed in making a livelihood from the water as in Maryland and Virginia. The oyster, fish and crab industries employ many thousands and in these lines the motor boats play a most important part. In Maryland the law prohibits the use of other than sail power in the dredging of oysters, but in Virginia, where the "rocks" and "bottoms" are leased, there is no restriction and there are at least 75 motor dredgers hailing from Hampton alone.

While the Maryland dredger may not

use power, not even to propel his boat to or from the grounds, the tonger, who works in 18 ft. of water or less, has found the gasoline motor to be a great boon. Not only does the power aid the tonger in reaching the "rocks" and putting him and his "jag" of oysters along side of the buy boat, but it saves him hours of valuable time, enabling him to reach the "rocks" earlier and remain longer, thus materially increasing his chances for a good catch.



AUXILIARY "BUGEYE" EMMA.

The followers of the water on the Chesapeake have but little idle time. The oyster season lasts from Sept. 15 to April 30. Then follows the fish and crabs that fill in the summer until about the first of August.

The first motor propelled work boat was a little buckeye named the No Name, owned by Henry Wickert, of Bodkin Creek, Md., who, in 1894, installed a four-h. p. White & Middleton motor. He was the pioneer in the employment of the internal combustion engine in commerce on the Chesapeake and he used her to run produce from his farm to Baltimore, making his trips with such regularity that his example was speedily followed.

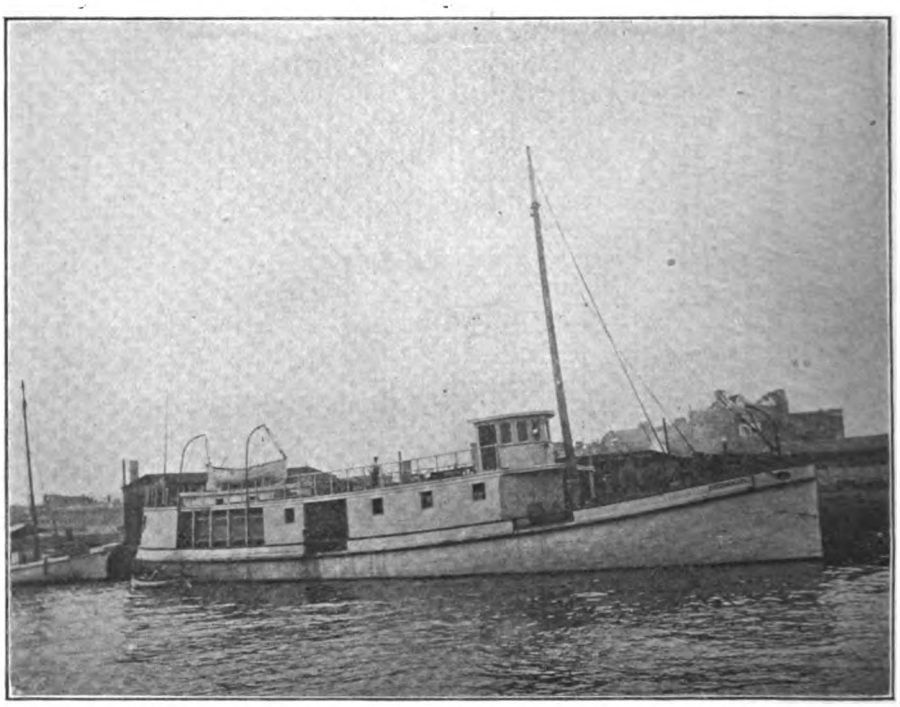
The No Name was but 35 ft. over all, but the second vessel to enter the business created considerable talk, for she was not only the first motor barge to be built on the Chesapeake, but she was the largest that had ever been built anywhere and was powered with the largest and most powerful marine motor to that time. This barge was the Elizabeth, built by C. Durm & Son, at Baltimore, for Robert Turner, of Betterton, Md. She was 91.6 ft. over all, 21.6-ft. beam and 5.6-ft. depth, driven by a 60-h. p. White & Middleton engine.

About the same time, at Crisfield, there was being fitted out a big side-wheel gasoline craft, the Bertie E. Tull, 163 tons, which is still in commission and which is the largest of the liquid fuel boats on the bay. The Tull is 125.4 ft. over all, 30-ft. beam over guards, and 6.1-ft. depth. As a side-wheeler, operated with a pair of 60-h. p. motors of the stationary type, she was a commercial failure and for a number of years she was laid up. About four years ago, she changed owners, was equipped with a 60-h. p. Globe motor driving a propeller, and she is now successful, running a route between Baltimore and the Sassafras river.

One of the best examples of a general passenger and freight boat is the Princess, 113 tons, which was built at Cambridge in 1907 and which plies along the western shore of Maryland. She is owned by Capt. John Reed, who has a fleet of several motor craft, and she is a familiar sight on the Patapsco. She is 110 ft. over all, 23.3-ft. beam and 6.7-ft. depth, driven by a 125-h. p. Harris motor.

A type that has many counterparts is the Leader, a sturdy representative of the "down-the-bay" shipyard, having been built at Madison, Md., in 1904. She is of 39-ton register, 70 ft. over all, 18.6-ft. beam and 3.4-ft. depth, driven by a 35-h. p. Globe motor.

The Lauretta Curran, 23 tons, is also a product of Madison and a feature about her is the sail she carries. This canvas is not calculated to be used save when the wind is following, but then, in a good breeze, it helps wonderfully. Besides the mast is useful as a derrick for loading and discharging. The Curran is 60 ft. over all, 18.3-ft. beam and 3.8-ft. depth, driven by a 30-h. p. Globe motor.



PRINCESS.

Another motor barge that carries a sail is the Nettie A. Ruark, which hails from Crisfield and which was built at Fishing Creek, Md., in 1906. She is

14 tons register, 50.5 ft. long, 15.7-ft. beam and 3.8-ft. depth. She is a dead rise model, a popular model because of cheapness of construction, and is driven by a 30-h. p. Regal motor.

There is also a large number of gasoline auxiliary craft on the bay and of these the majority are "buckeyes," or, as they are commonly called, "bugeyes." These craft, with their leg of mutton sails, are easily handled by two men and they are ideal for general freighting, being swift in light airs and capable of carrying sail a long time when it blows. For their tonnage they are much easier handled than a schooner would be and they are preferable because of this.

A splendid type of the "buckeye" is the Emma, an auxiliary that finds employment all the year around. In the months from September until the latter part of April she is in the oyster business as a buy boat, in the spring and summer she runs fish and after that she runs grain, so that she has no idle time.

The power yawl has become a most important feature during the past couple of years. Vessels of 15 tons or upward with auxiliary engines are compelled, by law, to carry licensed pilots and engineers. Besides that it has been found that a four or five-h. p. engine in a yawl will push a big vessel faster than a 10 or 12-h. p. engine in the larger craft. That not only means the doing away with the licensed men, but it also means the saving of much fuel. More than that it gives the use of the small boat for the usual purposes, saving rowing for the crew.

When not in use, these power yawls are either carried on davits across the sterns or are slung on deck and they are no more in the way than an ordinary boat would be, the difference in weight being but little consequence. When the wind drops, it is the work of but a few minutes to sling the yawl over the side, tuck its nose under the counter, or to hold it alongside, and let it chug away, pushing the bigger boat along at least two miles an hour, all of which counts in the long run.

Although the Maryland dredger cannot use an engine to propel his craft to, on or from the "rocks," he has found use for the gasoline engine, employing it to wind in the dredges. There are at present fully 100 dredgers so equipped and everyone of them have proven to be successful, not only making larger catches, but saving money. One of these dredges will do the work of four men and do it better, quicker and cheaper.

Latest Argentine Battleships

(Translated by *The Navy* from La Nacion, Buenos Ayres.)

THE normal displacement under ordinary conditions is 26,500 tons, but the trial displacement with all weights complete and 1,600 tons of coal (40 per cent of the total) will be 27,500 tons.* This large displacement will make the vessels very seaworthy and insure them a high offensive and defensive efficiency; such displacement being in accordance with the latest types under construction, the Arkansas and Wyoming of the United States navy, of 26,000 to 26,400 tons; the Hercules and Colossus of the British navy, of 24,000 to 25,000 tons (but with only ten 12-in. guns); and the Lion, also of the British navy, with a displacement of 26,000 tons, on all of which the main battery is arranged to fire on either side.

Hull.

Will be of the following dimensions: Length, 585 ft.; breadth, 98 ft.; normal draught, 27 ft. 6 in.

The heights above the normal water line will be as follows: Forecastle, 25 ft. 6 in.; amidship, 22 ft. 8 in; astern, 17 ft. 1 in.

These heights agree with those of English and American Dreadnoughts, as it is generally conceded that a forecastle lower than 20 ft. would impair seaworthiness. Externally our ships will appear much like the British Lion, whose keel has just been laid at the dockyard at Devonport, or much like the Arkansas and Wyoming now building for the United States navy at the yard of the New York Ship Building Co., and Cramp's, respectively. The superstructure on the upper deck will be completely suppressed, to avoid obstruction to the arc of fire of the main guns, as well as to reduce the target surface.

Starboard waist gun: Fires across ship 60 degrees forward of beam and 40 degrees abaft.

Port waist gun: Fires across ship 60 degrees abaft of beam and 40 degrees forward.

Armor.

For the protection of machinery and boilers there will be a main armor belt, of 12-in. uniform thickness, 200 ft. long, and extending 4 ft. 9 in. above and 3 ft. 4 in. below the normal water line.

This belt will be continued 75 ft. more at each end, till it comes abreast of the extreme turrets, but its thickness is reduced to 10 in. These belts will taper down from their original thickness to a thickness of 5 in. at the lower edge in a height of about 2 ft. On top of the main belt, for its whole length of 400 ft. there will be armor 9 in. thick at its lower edge, tapering down to 8 in. at the upper deck. Beyond the central redoubt the armor belt will be 6 in. thick forward and 4 in. thick abaft and will extend from the same depth below the water line up to gun deck. Besides the main belt and the side armor extending between the centers of the extreme turrets, there will be also, at the level of said turrets, some transverse armor extending from side to side, thus completing the armored box that will protect machinery, boiler, magazines, the main and secondary batteries. Above the upper deck there will be armor 6 in. thick for protection of the 6-in. guns. To avoid all dangers inherent to perforation of the smoke-stacks, same will be protected by 1½ in. nickel steel extending from their base up to 15 ft. above the upper deck. The arrangement of armor follows English, American, and Japanese ideas; but, as regards thickness and distribution, it resembles what has been adopted on the Japanese ships now building. The total weight of all armor, barbettes, turrets, etc., amounts to about 7,000 tons.

Underwater Protection.

Six hundred tons nickel steel has been allotted for this purpose, and it will be used for an inner bottom and two longitudinal bulkheads, one on each side. This protection will be completed by the ordinary double bottom and the system of transverse and longitudinal bulkheads, dividing the ship into numerous water-tight compartments fitted with electrically driven centrifugal pumps which can be operated even when the compartment is entirely flooded. Externally a steel torpedo net is held 30 ft. from the ship's sides.

Machinery and Coal Bunkers.

The motive power is composed of steam turbines, located in three separate and independent compartments. The main boilers are arranged in six compartments, three forward and three abaft of the engine rooms. In the case of serious accident to the

*Revised figures for displacement are: Normal, 27,500 tons; full load, 30,200 tons.

wing turbines, this arrangement of machinery allows the use of the central turbine, which can develop more than one third of the total power, while the sub-division of the main boilers in two groups always allows the use of at least one-half the boiler power and at the same time permits an ideal arrangement of coal bunkers.

The coal bunkers run alongside and above the boilers; and on each fireroom there is also a transverse bunker for use in action; when owing to the easier handling of the coal, it will be possible to attain the maximum speed.

The coal bunkers have a total capacity of 4,000 tons and the oil tanks in the double bottom will contain 660 tons of fuel oil.

Speed, Trials, and Radius of Action.

The main turbines can develop 39,500 H. P. with 1 in. of air in the firerooms, but the blowers will be required to produce a pressure of 2 in. of water. With a displacement of 27,500 tons, this power will give the ship a speed of 22½ knots, which is to be maintained for 8 hours. Besides this trial, which is to be considered as the most severe and which will amply insure the ship a speed of 22½ knots under ordinary service conditions, there will be a 30-hour endurance trial at 20 knots, and a 30-hour coal consumption trial at 15 knots. All these trials will be preceded by the necessary preliminary trials. The radius of action on coal only is to be 10,100 knots at 11 knots speed, 7,200 knots at 15 knots speed, and 3,600 knots at 22.5 knots. If the high speed trial were conducted under ordinary load conditions, the displacement would be 26,500 tons, instead of the required trial displacement of 27,500 tons, and the corresponding speed at the reduced displacement would be nearly 23 knots.

Artillery and Torpedoes.

The main battery consists of 12 12-in. 50-caliber guns, mounted in pairs in six turrets arranged so as to fire all on either side; twelve 6-in. 50-caliber guns installed in the central casemate, six on each side; and twelve 4-in. 50-caliber guns, besides smaller field and saluting guns. The 12-in. gun turrets will have a protection of 12-in. armor in front, 9-in. armor at sides, 11-in. armor at back, and 3-in. armor on top.

The circular barbettes, which serve as support to the turrets, are 9 in. thick. The armor and guns will be manufactured by the Bethlehem Steel Co.

Follows some gun data:

Caliber of guns.	Weight of shell, kg.	Initial velocity mt. per sec.	Muzzle energy tons—meters.	Shots per min. per gun.
12-in.	349.2	914.4	16,890	2
6-in.	47.6	914.4	2,028	6 to 8
4-in.	15	914.4	640	12

The 12-in. guns are capable of perforating an armor plate of cemented steel 14 in. thick at 6,000 meters.

The magazines have a capacity of 120 rounds for each of the 12-in. guns, 300 rounds for each of the 6-in. guns, and 350 rounds for each of the 4-in. guns.

The axis of 12-in. guns above the water line is as follows:

Turret No. 1 forward 31 ft. 8 in.
Turret No. 2 forward 39 ft. 8 in.
Turret No. 3 forward 31 ft. 8 in.
Turret No. 4 forward 31 ft. 8 in.
Turret No. 5 forward 31 ft. 8 in.
Turret No. 6 forward 22 ft. 5 in.

The axis of the 6-in. guns is 19 ft. 6 in. above the normal water line and was fixed to overcome the faults observed with lower batteries, which in rough weather are practically useless, owing to the necessity of closing the gun ports. The 4-in. guns and munitions are equal to and interchangeable with the same size used on the destroyers, which will be manufactured by the same concern. These ships will be fitted with two 21-in. submerged torpedo tubes using torpedoes equal to those that will be used on the destroyers.

Conning and Fire Control Towers.

There will be two conning towers, one forward of 12-in. armor and one abaft of 9-in. armor. The fire control towers will be located as follows: One on the auxiliary mast, one above each conning tower, one auxiliary station on each side of the ship on small independent armored turrets; one main central station within the casemate under the protective deck.

Miscellaneous.

The upper and lower protective deck will have 1½-in. and 3-in. armor. The electric power will be supplied by two main stations in duplicate, each fitted with turbo-dynamos capable of generating all the power required in action, and located within the armored casemate. There will also be a third installation, operated by heavy oil motors, of sufficient power to illuminate the ship and also to handle some of the turrets for practice. This station will obviate the necessity of maintaining boilers under pressure for auxiliary service in the harbor, which ought to result in better preservation of boilers and steam piping. Searchlights of sufficient number and power will be conveniently located.

Memorandum of Argentine Ships.

Tonnage, 27,500 normal.
Speed, 22½ knots.
Main belt armor, 12 in. thick.
Price per ship, £2,190,000 sterling.
Time of completion, 24 and 27 months.
Armament, 12 12-in. guns in turrets (50 cal.), 12 6-in., 12 4-in.
Machinery, 3 Curtis turbines of 40,000 H. P.
Boilers, B. & W. watertube.
Ships can fire twelve 12-in. guns on either broadside—8 ahead and 8 astern.

One vessel will be built at the Fore River Ship Building Co., in 24 months, and the second vessel at the works of the New York Ship Building Co., in 27 months, both vessels to be designed and engined by the Fore River Ship Building Co.

Britain's Largest Battleship Launched

On Saturday, Aug. 6, the battleship cruiser Lion was launched from the government dock yard at Davenport. The vessel is not only the largest warship in the British Navy, but she is easily the fastest and most formidable armoured cruiser afloat. Although officially termed a cruiser, her broadside fire of eight 12-inch guns will be as heavy as the Dreadnought's, notwithstanding that she will mount only eight in all of the big weapons, as against the ten of the latest British battleships. Her over all length is 700 ft. by 86 ft. 6 in. beam, as compared with the Lusitania and Mauretania's length over all of 790 ft., and beam of 88 ft. The great stride in size represented by the Lion is shown by the following table, comparing her dimensions with those of the Indefatigable, Britain's latest armored cruiser prior to Saturday's launch:

	H.M.S. Lion.	H.M.S. Indefatigable.
Length	700 ft.	596 ft.
Beam	86 ft. 6 in.	80 ft.
Displacement	26,350 tons	18,750 tons
Designed speed	28 knots	25 knots
Horsepower	70,000	45,000

The propelling machinery consists of Parsons' steam turbines, driving four screws, and giving an estimated shaft horsepower of 70,000. Her steam generating installation will consist of 42 water tube boilers. This propelling machinery—the most powerful in any vessel so far constructed—is being supplied by Messrs. Vickers, Sons & Maxim, Barrow.

The main armament comprises eight 12-in., 50-caliber guns, mounted in pairs, all four turrets being on the middle line of the ship. The guns in each of the inner turrets can be fired over the outer turrets, and, owing to the greatly increased deck area, the striking power shows a great improvement over that of the Indefatigable's guns. The armor

consists of a long, deep belt, 9 in. thick, with an armored bulkhead at each end. This belt is 3 in. less in thickness than the maximum of the side armor of the Dreadnought battleships, but is 2 in. thicker than that of the armored cruisers Indefatigable and Invincible. From the foregoing description, it will be seen that the British Admiralty may claim that in the Lion they have made an enormous advance in all the essentials of an armored cruiser—speed, gun power, and protection—but at a cost of over two millions sterling, or, say, the price of two first-class battleships of only a few years ago.

The hull and propelling machinery of the Princess Royal, a sister ship to the Lion, is now under construction by Messrs. Vickers, Sons & Maxim, Barrow-in-Furness.

A LARGE BLACKSMITH SHOP USING OIL FUEL EXCLUSIVELY

A Modern Pacific Coast Plant and Its Unique Liquid Fuel Equipment and Shop System

By Holden A. Evans, Naval Constructor United States Navy.

Continued from August Issue.

THE author not only believes in a thorough detail analysis of the work to be accomplished and careful consideration of the best methods for obtaining the results desired, but also realizes fully that it is impossible to obtain the maximum output from men unless they are well rewarded. It is a long step, however, from the conditions usually found to those which we know to be possible. It is more difficult to make radical changes in methods in government shops than in commercial shops, and it must be realized that the progress of scientific shop management is slow in commercial shops as well as in government establishments. There are a large number of shops of various kinds under my supervision, and to obtain the best results in reasonable time would require the services of highly paid experts to work out the best organization in each shop. I felt that the time had not yet come for such experts, and that the haphazard go-as-you-please methods could be improved by myself and my assistants without interruption to the work of the department under my charge. About five years ago I began this work, and one of the first steps was to get my assistants equally interested in the subject of scientific shop management. The effort was successful, and we have been able to take shop by shop, and make improvements, and note the good results obtained. In describing the system followed in the blacksmith shop, I wish to emphasize that the improvements made are really but the first steps towards scientific management, and are merely the introduction of a systematic and logical method of handling the work where none existed before. Unfortunately the same conditions exist in the great majority of the jobbing smith shops throughout the country. The methods now employed in the shop under discussion are simple and can be used in almost any shop, but

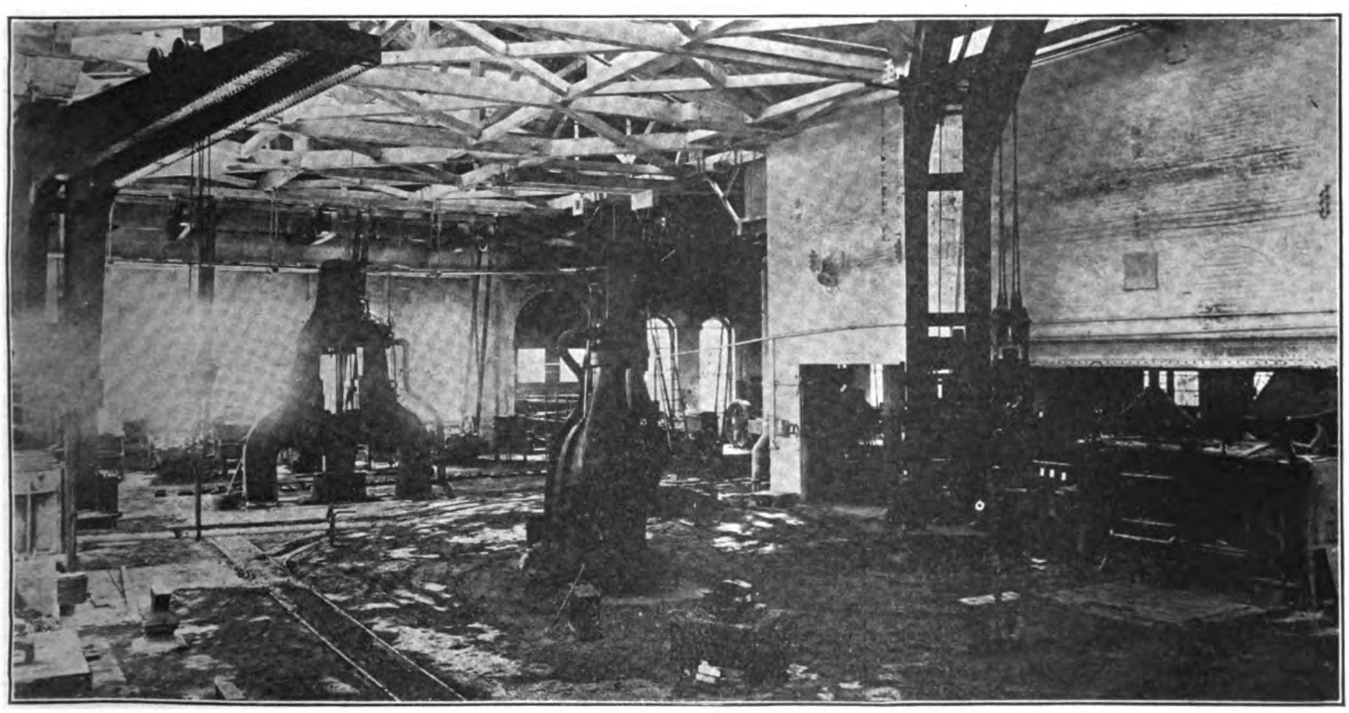


Fig. 18—Heavy Forge Shop, South Wing.

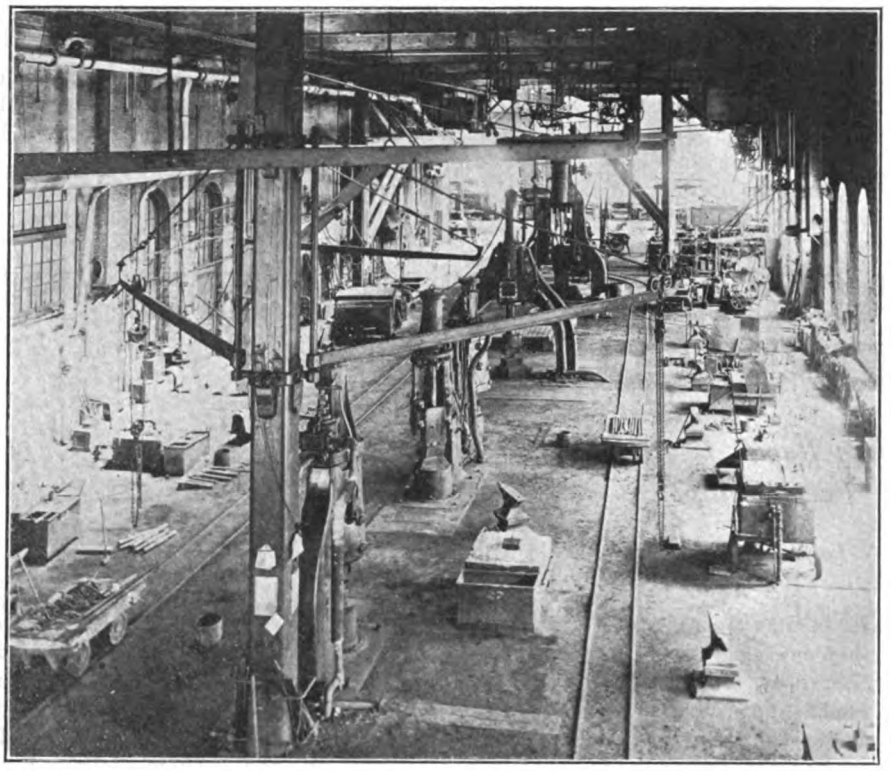


FIG. 19—VIEW IN MEDIUM HEAVY WORK SMITH SHOPS IN WEST WING (NOTE HOLDER FOR INSTRUCTION CARDS ON POST IN FOREGROUND).

are recommended only as the first step toward scientific management.

The duties of the foreman and others, and the routine followed, are laid out in detail in written instructions issued to the shop, and in the description which follows these instructions will be freely quoted.

Foreman's Responsibility and General Duties.

The foreman is held directly resonsible for all work in his department. He is expected to maintain the highest efficiency possible in his organization. Owing to his superior mechanical ability he is expected to devise schemes and methods equal, and, if possible, superior to those in other large plants handling similar work. He will make a study of the special ability of each individual mechanic.

He will in person receive all orders for work to be executed in his department. Upon receipt of job orders or shop orders, he will go over each and designate to whom the work shall be assigned, giving the necessary instructions, and note particularly any peculiarity or unusual conditions regarding the work, furnishing the data necessary for the routeman to make out the instruction cards intelligently.

He will see that all material received from the storehouse corresponds in quantity and quality with that ordered, utilizing the third copy of the requisition for this purpose. He is responsible that the material used is suitable for the work.

He will utilize any special tools on hand that can be used to advantage, and if none are available and he considers it desirable to make such tools for a job, he will request the necessary authority from the shop superintendent. In other words, the foreman will give each job order his personal attention and study, assuring himself that all details have been arranged to enable the work to be completed expeditiously and economically.

These instructions are not to be construed to make an office clerk of the foreman. It is intended that every job to be accomplished shall be analyzed and planned by the foreman before being undertaken in order that each may receive the benefit of his experience and knowledge.

In carrying out these duties the foreman will have the assistance of two assistant foremen on the floor of the shop, one in charge of all small work in the north end of the shop, and the other in charge of the heavy work, the bolt machines and the tool department in the south end of the shop. He will also be assisted by a route-man, an office clerk, a material and move man, and a messenger boy. The duties of the various assistants to the foreman are as follows:

Assistant Foremen.

Each assistant foreman is responsible to the foreman for all work performed in his division. It is his duty to see that each workman properly understands the work assigned to him, and he will supply the workmen with all information necessary to carry out the directions given on the instruction cards. He will see that each workman has at least one job ahead with the necessary stock at the forge and with the necessary templates, sketches, or plans, in order that the work may be immediately taken up when the job in hand is completed. When a new

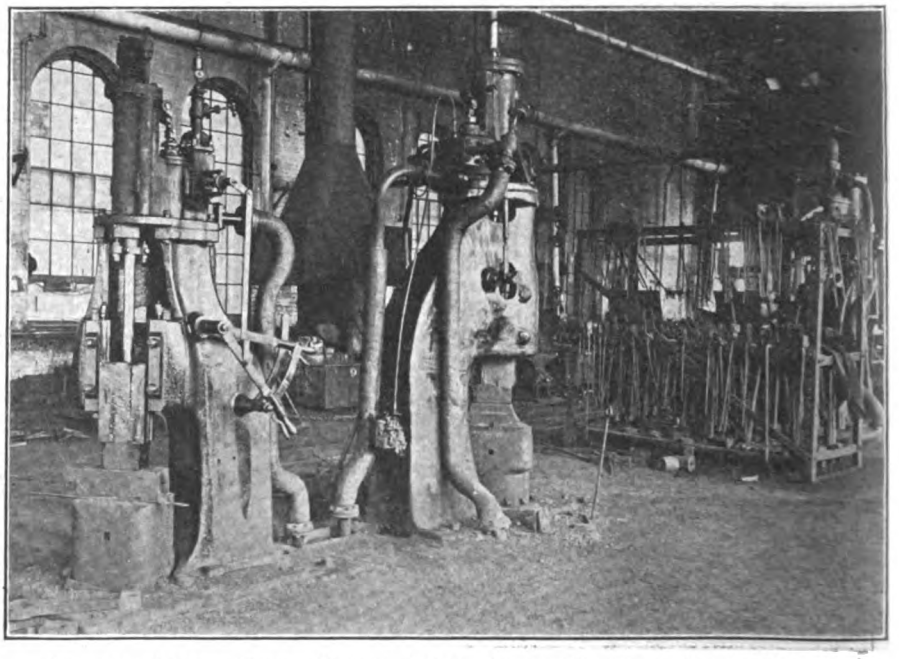


FIG. 20—SMITH SHOP, NORTH WING, SMALL HAMMERS PLACED BACK TO BACK TO ECONOMIZE SPACE.

instruction card is issued, it is the duty of the assistant foreman to decide upon the detailed methods to be followed to carry out the instructions, and the proper size and amount of material required. In ordering stock the assistant will use an order slip, giving the size and amount of stock required, the job order number, and the forge at which the material should be placed. This slip will be dated and signed by the assistant foreman and will be given to the material and move man. If, in any case, he is in doubt, the foreman will be immediately consulted. The assistant will inspect all finished work before it leaves the forge, and will attach a tag giving the necessary information to enable the move-man to move the work to its proper place.

The route man will carry out the details of routing the work from the data contained in the job order or shop order, and the instructions given by the foreman. He will make out and issue the instruction cards and make out the standing order cards for the same. He will keep the route board in the foreman's office to conform to the exact condition of the work in the shop. He will keep the order file up to date, filing promptly orders that have been routed and removing orders that have been completed. He will keep the "tickler" file for promises made to other shops, or promises made by other shops. The route-man will make sketches when necessary to issue with the instruction cards. He will index and file all plans received in the shop.

Office Clerk.

The office clerk will keep the records of the men, attend to the time cards, check the records of time given on the instruction cards and file the same. He will make out requisitions for material from the storehouse as called for on the order slips furnished by the material and move-man. He will keep the "orders to foremen" files up to date and perform all clerical work required in connection with the work of the shop.

The material and move-man will keep an accurate record on the stock cards of the material on hand. He will see that all requests from the assistant foremen for material are immediately supplied exactly as called for and that it is delivered to the forge specified on the order slip. The order slips will be turned over to the office clerk daily. He will keep a record of the fire bricks used by each forge and furnace; he will record the oil meter readings; he will remove finished work from the forge to the station specified on the tag attached to the work. A laborer will be assigned to him as an assistant, and when he requires additional labor to handle heavy stock the assistant foreman will supply the necessary men.

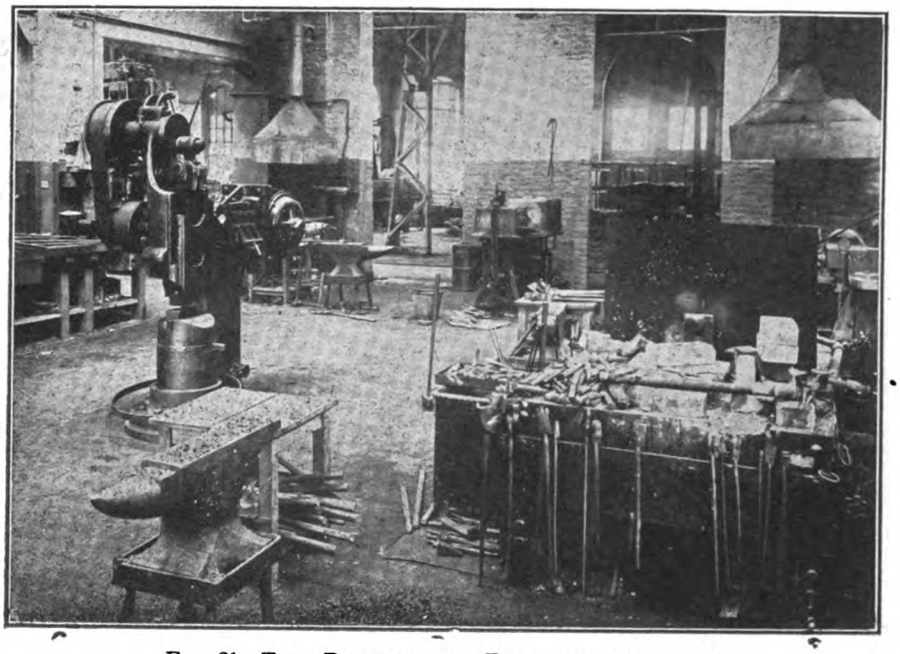


FIG. 21—TOOL DRESSING AND TEMPERING DEPARTMENT.

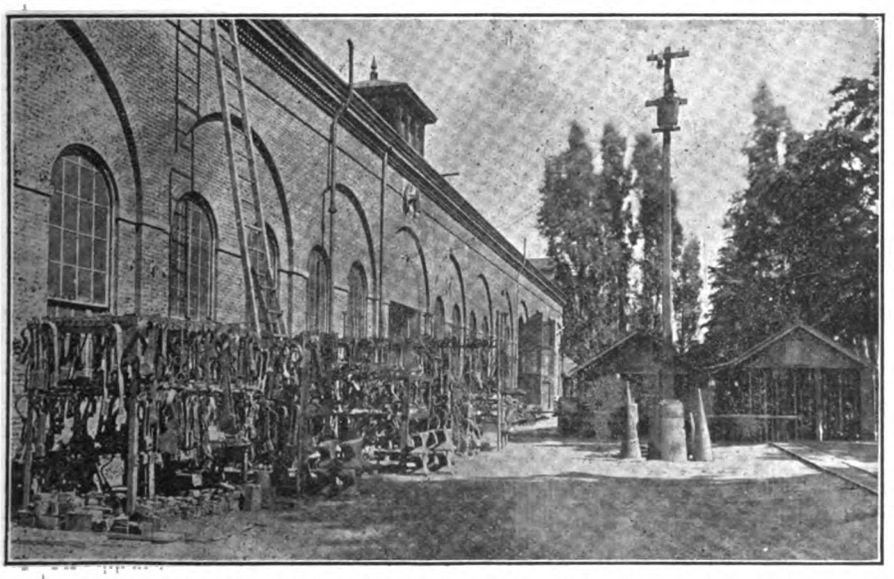


FIG. 22—REAR OF SMITH SHOP, SHOWING TOOL AND STOCK RACKS.

Routine for Handling Work.

All work is ordered from the smith shop, either by job order, Fig. 25, from the main office, or by shop order, Fig. 26, from another shop. The shop orders are based on job orders issued by the main office to other shops. As the greater part of the work consists of repairs where the smith work is only a small part of the job, the greater portion of the work in the smith shop is on shop orders from other shops. The shop order shown in Fig. 26 requires but little explanation, but it requires considerable educational work to have the orders properly issued. Some trouble was experienced in getting the foreman issuing the order to fill in the date that the work would actually be required. It required no investigation or thought to fill in "as soon as possible," or "immediately," and a great many orders were made out in this way in the beginning. The greatest difficulty, however, was experienced in getting the foremen receiving the order to make an intelligent promise. When first used it was found that promised dates of completion were, in some cases, made without the foreman knowing the work to be accomplished, and in

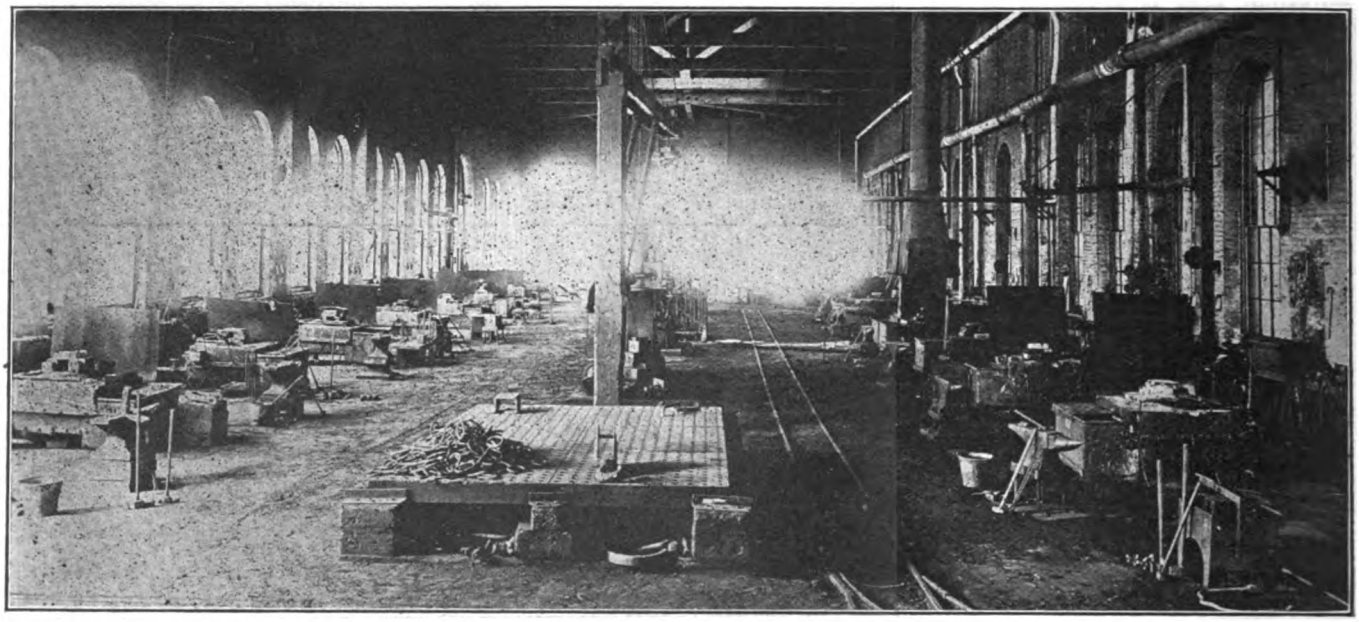


FIG. 23—MISCELLANEOUS SMALL WORK SMITH SHOP, NORTH WING.

nearly all cases were made with but little consideration of the job itself, or of other work in the shop. In other words, we had added red tape and accomplished nothing. With a little education and constant watchfulness, this was corrected. At present care is taken that the date given on which the work should be completed is reasonable, and is the time that the work should be delivered, and the promised date of completion is only given after the work is carefully sized up. If the date is beyond the date on which the work is required, the foreman requiring the work is immediately telephoned and, if the question is not satisfactorily arranged, it is immediately referred to the shop superintendent. A tickler file is kept in each shop of promises made and promises due, and failures to keep promises are reported to the shop superintendent.

All shop orders and job orders go direct to the foreman, who studies each job and notes on the back of the order such instructions as he thinks necessary. He also assigns the work, which he is able to do, for the standing order board in his office, which will be described later, shows the work assigned to each forge or furnace. The orders then go to the route-man, who makes out the instruction cards which are to go to the men, and the standing order slips which are to go to the standing order board in the foreman's office. In the photograph on page 82, the foreman's office is shown. In Figs. 23 and 24 the route board and file case are shown. The instruction card is given in Fig. 27 and is self-explanatory. At each forge or furnace, there is a metal holder with places for three of these cards, all cards being in view. The top card is the one on which the man is working, the second is the next job for which material, tools, drawings, etc., have been provided. The third card is work assigned, for which material, tools and information are being collected. Each workman in charge of a gang records on this card the time actually spent on the job. For each instruction card there is a corresponding standing order slip which contains a brief of the job, the job numbers, and the forge to which the work is assigned and the slip, shown in Fig. 28, goes to the standing order board. The standing order board is divided up for the various forges and furnaces, and has the numbers of the various men in charge of gangs over hooks on which the order slips hang. The board also is provided with file cases for active and inactive orders, and pigeon holes for instruction cards made out, but not assigned, and pigeon holes for completed instruction cards.

When there are already three jobs at a forge, the instruction card with the standing order slip pinned to it is placed in a pigeon hole under the proper heading. The foreman can at a glance at the standing order board tell the condition of the work in the shop. He can see where each job is and the amount of work in the shop

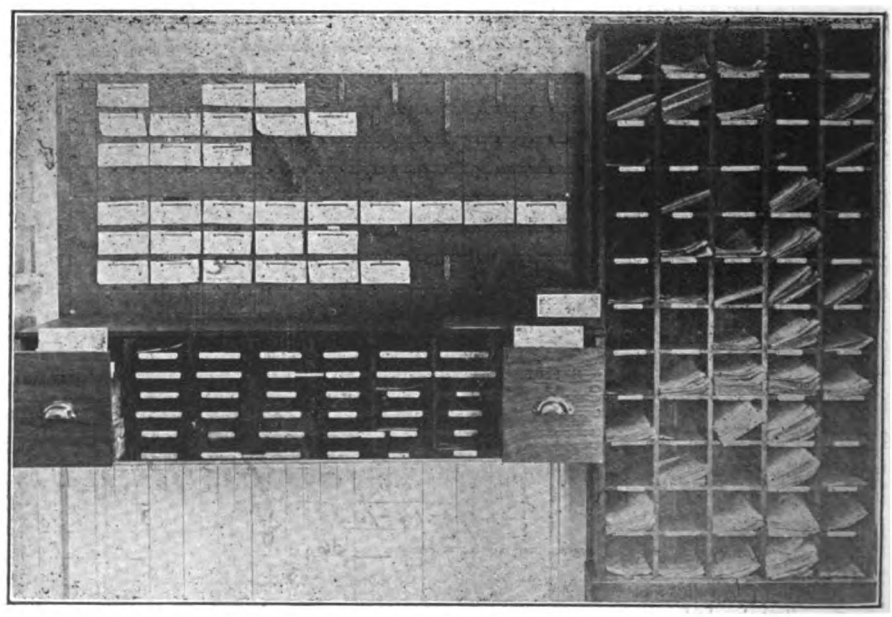


FIG. 24—STANDING ORDER BOARD IN FOREMAN'S OFFICE. (FROM THIS THE LOCATION AND STATUS OF EACH JOB CAN BE QUICKLY DETERMINED).

Job Order No. 45/118 Title D Sub-Title IRIS

Appropriation C&R 1910 Gen'l Head H & F - E & M

NAVY YARD, MARE ISLAND, CAL.,

Hull Division May 11/10 19

Sir:- You will please make one boat davit and deliver to store for shipment for after davit of first cutter. Use old davit now on yard scrap heap, which can be bent and fitted in conformity with attached sketch.

NOTE: This work must be completed and davit delivered to the General Storekeeper by Friday noon, May 13, 1910.

	ESTIMATED COST	ACTUAL COST
Labor	16 00	
Material	2 00	
Indirect	12 00	
Total	30 00 3 d	

Authority Commandant's 3d end. of May 10/10 No 881

Date of Completion

To Master Shipsmith

Respectfully,

H. A. Evans
Naval Constructor,
U.S.N.

To be returned to office upon completion of work

FIG. 25—MAIN OFFICE JOB ORDER. ALL WORK IS ORDERED IN THIS MANNER.

NAVY YARD, MARE ISLAND, CAL.

SHOP ORDER. April 12-10

OUTPUT ACCOUNT

JOB ORDER No. 115/107 APPROPRIATION C&R

TITLE D SUBTITLE Calif. GENERAL HEAD Cooling Tripod

TO Shipsmith SHOP.

You will do the following work charging labor and material as above:

Furnish labor and material to make one Cooling tripod as called for on plan # 6813

WORK SHOULD BE COMPLETED BY May 19-10

R H Thurman FOREMAN Machine SHOP 2.

ORIGINAL AND DUPLICATE TO BE FORWARDED TO SHOP IN WHICH WORK IS TO BE DONE. FOREMAN RECEIVING ORDER WILL PUT IN DATE OF RECEIPT AND DATE ON WHICH WORK WILL BE COMPLETED. RETAIN ORIGINAL AND IMMEDIATELY RETURN DUPLICATE. WHEN JOB IS COMPLETED FOREMAN DOING WORK WILL FILL IN ACTUAL DATE OF COMPLETION AND FORWARD TO SHOP THAT ISSUED THE ORDER AND IF WORK IS SATISFACTORY ORDER WILL BE INITIALED AND RETURNED TO THE FOREMAN WHO DID THE WORK

ORDER WAS RECEIVED April 12-10 AND THE WORK

WILL BE COMPLETED May 19-10 FOREMAN L.M.

WORK ACTUALLY COMPLETED May 19-10 FOREMAN L.M.

IS WORK SATISFACTORY? Yes. O.K.

R H Thurman FOREMAN

FIG. 26—SHOP ORDER FOR OUTPUT ACCOUNT. BASED ON A JOB ORDER ALREADY ISSUED TO ANOTHER SHOP. (IN DUPLICATE.)

not yet assigned to a forge. From this inspection and consultation with his tickler file of promises he can learn whether he should take on some additional men or change some of the assignments already made to give preference to work at an early date.

The assistant foreman in charge of a division begins the assembly of tools, drawings and material, as soon as a new instruction card is issued. He makes out a "minor material" slip, Fig. 29, the material required and he gives this to the material man. If the material is on hand in the shop stock it is drawn, and if not the office clerk is notified and it is ordered from the main store.

When a job is completed the man in charge of the gang, after entering the time of the gang, removes the card from the holder and hangs it on a hook provided and moves up his next card and starts his job. The assistant foreman inspects the completed job, initials the instruction card, and attaches to the work a tag bearing his inspection mark and designating the place to where the work will be moved. The material man moves the work and takes the instruction card to the office and places it in the basket provided on the desk of the route man. The route man removes the standing order slip from the route board and the order for the work from the file, pins the latter to the instruction card and places the two in a basket provided on the desk of the foreman. The foreman will close the job, returning the order with the date of completion marked. The costs of direct labor as shown by the instruction cards will be scrutinized and compared with previous costs, and then will be indexed and filed. The shop superintendent goes over these

CHECK No. 2413 JOB ORDER No. 115/107

ARTICLE Fittings for one Cooling Boom

ISSUED 4-13 1910 COMPLETED 4-18 1910 BY H.M. forge

INSTRUCTIONS

Forge all fittings called for on plan # 6813

Finished forgings to be delivered to # 2112-forge

DATE	RT	HR	DATE	RT.	HR.	DATE	RT	HR	DATE	RT	HR	DATE	RT	HR.
4-14-10	53	8	4-15-10	53	2	4-18-10	53	6						
"	36	8	"	36	2	"	36	6						
"	36	8	"	36	2									

FIG. 27—INSTRUCTION CARD ISSUED TO THE WORKMAN.

MFG. DEPT. 614

STANDING ORDER

J. O No. 115/107

Machine No. 2113-Forge #25 Date, 4-13 —1910

Name of Piece and Operation

Forge fittings for Coaling boom

FIG. 28—STANDING ORDER SLIP. THIS IS PLACED ON THE STANDING ORDER BOARD AND SHOWS LOCATION OF WORK.

MINOR MATERIAL

Ship California Date 4-13-10

Job Order No. 115/107

Deliver 265 lbs. 3"x3" mild steel to Millet, forge #25

LEADING MAN

FIG. 29—MATERIAL SLIP FURNISHED TO THE MATERIAL MAN BY ASSISTANT FOREMAN.

JOB NO. 115/107 C

OBJECT California Coaling booms forging fittings

DATE 5-11-10

CHECK NO. 2172

NAME Greenwood

PAY 4.24

HOURS 8

TOTAL 8

APPROVED BY:-

(ENTER BUT ONE JOB ORDER ON EACH CARD)

FIG. 30—WORKMAN'S TIME CARD GOES TO MAIN OFFICE AFTER CHECKING BY ASSISTANT FOREMAN.

ARTICLE 3/8"x2" Mild Steel

MAXIMUM 5000# MINIMUM 100#

JOB ORDER NO.	ISSUED	RECEIVED	DATE	BALANCE	JOB ORDER NO.	ISSUED	RECEIVED	DATE	BALANCE
			1-12-10	480#					
174/154	350		1-18-10	130					
37/140	45		1-21-10	85					
174/154		30	1-22	43					
37/140	50		2-3	365					
174/154	12		2-21	343					
37/140	60		3-4	283					
37/140		80	3-4	283					
341/140		135	3-8	468					
260/	40		3-21	428					

FIG. 31—STOCK CARD FOR SHOP STORE.

records frequently and picks out and has recorded such as can be used as standard costs.

In addition to the detail record of time kept on each job on the instruction cards, each man makes out his own time card, Fig. 30, for each job on which he works each day. These time slips go to the accounting department in the main office and from them the pay roll is made up. They are also posted under each shop to the job number and it is from this record that the total cost, including, usually, work in a number of shops, is obtained. The total pay roll each day is checked out against the total cost shown from the job order cost cards. It will thus be seen that there is some duplication in the records. This duplication pays for itself many times over, as it enables detail costs of each operation to be obtained, and it enables the foreman and shop superintendent to obtain immediately a job is completed the direct cost of each operation.

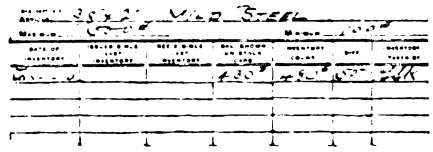


FIG. 32—INVENTORY CARD FOR SHOP STORE.

A reasonable stock of ordinary material is maintained in the shop store. The main supply of material is, however, in the main storehouse, which is drawn on for material not in the shop store, and for replenishing the latter. There is an accurate record kept of all material in the shop store. The records are kept on a stock card, Fig. 31, which shows all receipts and issues, and on the inven-

S. & A. FORM 139 A. 1-8-10—200m

NAVAL SUPPLY FUND STUB REQUISITION

STUB NO. 25863

DATE 5-6-10 DEPARTMENT OF Steel Ships

JOB ORDER	TITLE	SUBTITLE	APPROPRIATION	GENERAL HEAD
115/107	D	Calif	C&R '10	Coaling Tripods

CHECKED BY ..... FOR MATERIALS AS FOLLOWS: PRICED BY .....

STOREKEEPER TO ENTER CALL OR INVOICE NO.	CLAIM NO.	QUANTITY.	ITEM AND DESCRIPTION	UNIT PRICE	EXTENDED AMOUNT
		20 ft.	Pipe 7½" dia. Black Double extra strong steel	1.15	23 00
		186 ft.	Pipe 3" dia. black Double extra strong steel	1.60	28 80
		263 lbs.	3/4 sq. billet steel	.02	5 26
					57 06

FIG. 33—REQUISITION FOR MATERIAL FROM MAIN STOREHOUSE.

MFG. DEPT. 1102 NAVY YARD, MARE ISLAND, CAL.

SHOP ORDER. May 13-10

EXPENSE ACCOUNT

JOB ORDER No. S & M.

TO Machine SHOP. 2

ESTIMATED COST LABOR 60 00

ESTIMATED COST MATERIAL 10 00

TOTAL 70.00

APPROVED BY C. W. Fisher

INSTRUCTIONS.

1. ORIGINAL AND DUPLICATE TO BE FORWARDED TO THE FOREMAN WHO IS TO DO THE WORK, WHO WILL FILL IN THE ESTIMATE AND FORWARD BOTH COPIES TO THE OFFICER AUTHORIZED TO APPROVE THE WORK. AFTER APPROVAL BOTH COPIES WILL BE FORWARDED TO THE FOREMAN WHO IS TO DO THE WORK, WHO WILL FILL IN THE DATE OF RECEIPT AND DATE OF PROMISED COMPLETION. INITIAL, RETAIN ORIGINAL, FORWARD DUPLICATE TO SHOP REQUESTING WORK AND PROCEED WITH THE WORK.

2. WHEN COMPLETED, DATE OF COMPLETION WILL BE FILLED IN AND ORIGINAL FORWARDED TO FOREMAN REQUIRING WORK, WHO WILL EXAMINE WORK, STATE IF SATISFACTORY, INITIAL AND RETURN TO FOREMAN WHO DID THE WORK.

WORK REQUIRED.

Please furnish labor and material to repair broken Casting on Small Sellers Steam Hammer in Smithery

WORK DESIRED COMPLETED BY 5-21-10

D. Monro

FOREMAN Shipsmith SHOP

ORDER WAS RECEIVED May 13-10, AND THE WORK WILL BE COMPLETED May 21-10 FOREMAN D.M.

WORK ACTUALLY COMPLETED 5-20-10 FOREMAN D.M.

IS WORK SATISFACTORY? Yes. O.K.

D. Monro

FOREMAN

FIG. 34—SHOP ORDER FOR REPAIRS ON TOOLS, ETC.

tory cards, Fig. 32, which are self-explanatory. No material is issued except on a material slip, signed by the foreman or one of the assistant foremen. These slips are turned in each night at the office for record. Material from the main storehouse is drawn on a requisition, Fig. 33, which is self-explanatory.

Results Obtained.

From the description it might be inferred that a complicated system is employed, but this is not the case. The methods followed are direct and simple and give excellent results.

Municipal Docks at Seattle

Preliminary plans and arrangements are being prepared by the city government of Tacoma, Wash., for a system of municipal docks to provide a public landing for all small craft. The site of the proposed docks is along the city waterway between Eleventh and Fifteenth streets, covering 1,440 ft. The project includes a fire-proof building, the lower floor to be used for freight, the second for passengers, and the third for storage.

A replat of the tide flats of Tacoma harbor fully described in THE MARINE REVIEW for June is in progress and a number of plans are being presented for future harbor development and a system of municipal docks. An attempt is being made to secure better transportation facilities to the tide flats by the construction of a new bridge on Eleventh street.

There are three salient points being considered. The first is to confine the Puyallup river, for the last 4,000 ft. of its course, to a scouring channel 100 ft. wide, instead of the 500-ft. width through which it now enters the sound. Two bulkheads 150 ft. apart are proposed, one forming the west wall of the scouring channel and the other the east wall of a still water channel, the latter to be 250 ft. wide, and between the two bulkheads, a fill of 26 ft. above low water. The still water channel is to be 35 ft. deep at low tide, available for the deepest draught steamers.

The second feature of the plan is to convert Sitcum avenue to a deep sea waterway, 4,000 ft. long. At an angle of 45 degrees from the east bank of this waterway are to be four slips, each 1,000 ft. long, 200 ft. wide, and 300 ft. apart. All wharf space between the slips on the east side of the Sitcum avenue waterway is to be city property.

The third feature is the opening of Puyallup boulevard from the intersection of Sitcum avenue and the inner harbor line to the main line of the Chicago, Milwaukee & Puget Sound railroad, three miles to the south. This boulevard is to be forever used by municipal railroad tracks, to touch the foot of each lateral slip from Sitcum waterway and to afford direct connection with every railroad now in the city or that may enter the city.

Heffernan Improvements at Seattle

In THE MARINE REVIEW of April, 1910, was noted the purchase of a large section of Seattle tide land by J. T. Heffernan, president of the Heffernan Dry Dock Co., and Heffernan Engine Works. As a second step in the establishment of his ship repair plant, Mr. Heffernan has purchased and moved to his plant the marine railway and ways formerly operated by the Seattle Ship Yards Co., at Ballard. The Heffernan Dry Dock Co. will move its floating dry dock, which is 385 ft. long and 100 ft. wide with a capacity of 8,000 tons, back and place the marine ways, which are 250 ft. long and 56 ft. wide with a capacity of 4,000 tons, adjoining the dock. This will enable them to handle vessels of all sizes quickly for repair work. The improvement of the tide land on the East Waterway includes the erection of a boiler shop and machine shops with all facilities for repair work. The machine shops of the Heffernan Engine Works will be moved to the new location as soon as the new plant is sufficiently far advanced and the Heffernan companies will specialize in repair work.

The Great Lakes Dredge & Dock Co., of Chicago, was the lowest bidder for excavation work to be done in Erie harbor, its bid being $42,960.

A PROPOSED METHOD FOR RAISING THE MAINE FROM HAVANA HARBOR

(From *The Engineering News.*)

IN THE session of Congress recently adjourned two bills were passed appropriating first $100,000 and then $200,000 additional to be expended under the direction of the engineer department, U. S. Army, in raising the wreck of the U. S. battleship Maine from her 12-year old berth in the bottom of Havana harbor. Owing to clerical inconsistencies in the second of these two bills, there at first was some doubt in the minds of the officials at Washington as to the legality of the $200,000 appropriation, but the Attorney-General, after examination of the matter, reported that the whole $300,000 is now available. Meanwhile the chief of engineers, Gen. W. H. Bixby, has under consideration a number of schemes for raising the ship and some definite plan will soon be adopted for the prosecution of the work.

Among the plans which have been submitted, one of the most practicable is that devised by John F. O'Rourke, M. Am. Soc. C. E., New York City, the well-known foundation and tunnel engineer. Mr. O'Rourke has had his idea patented and proposes to undertake the work for the government under the general direction of the army engineers, but with the force and equipment of the company of which he is president. In the present article, we are able to present the outlines of the plan and the details of the apparatus to be used.

The U. S. battleship Maine was sunk in about 35 ft. of water at her moorings in Havana harbor on Feb. 15, 1898, as a result of an explosion at the forward part of her hull. This explosion tore away the entire forward section of the vessel, but left the remainder intact and in that portion are still the bodies of some 200 of the crew who were drowned when the ship went down. The fact that the forward portion is so completely wrecked makes extremely difficult any method of raising, which involves the filling of the hull with compressed air and makes some style of coffer-dam pontoon or adjacent raising device almost necessary in the raising. The first style of salvage operation, in fact, is the only one which heretofore has been given much publicity in this particular wreck and was quite fully described in *Engineering News*, Dec. 8, 1904, page 520. At that time, a company was formed, which proposed to drive around the wreck a specially designed circular bi-walled coffer-dam, to pump out the dam and in the dry area to make the ship seaworthy. The scheme, however, never got far beyond the design stage. The pontoon scheme is complicated by the necessity for helmet-divers' work. The third scheme, that of adjacent solid docks from which the lifting operations may be carried on, is the basis of Mr. O'Rourke's idea, though the use of pneumatic caissons is the fundamental feature of the scheme.

The water at the site of the wreck is about 35 ft. deep and overlies a soft muddy bottom, into which the hull has sunk another 10 ft., and only the upper works now stick up above the water surface. Havana harbor is remarkably well protected and there is only about a 10-in. range of tide with hardly any wind or wave action, so that any operation, such as will be required by Mr. O'Rourke's scheme, will not be hampered by bad weather conditions.

In brief, Mr. O'Rourke's scheme consits in raising the Maine on a cradle of cables, slung under the ship by means of laterally placed pneumatic caissons

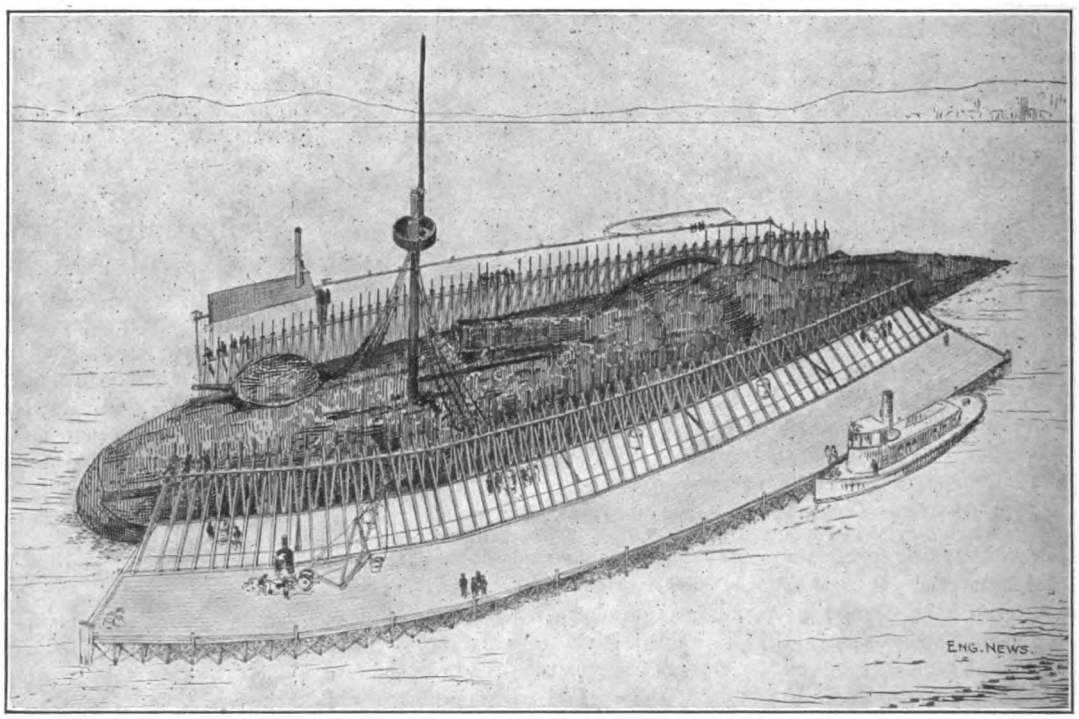


FIG. 1—PERSPECTIVE VIEW OF RAISING OPERATION PROPOSED BY JOHN F. O'ROURKE TO RAISE THE MAINE.

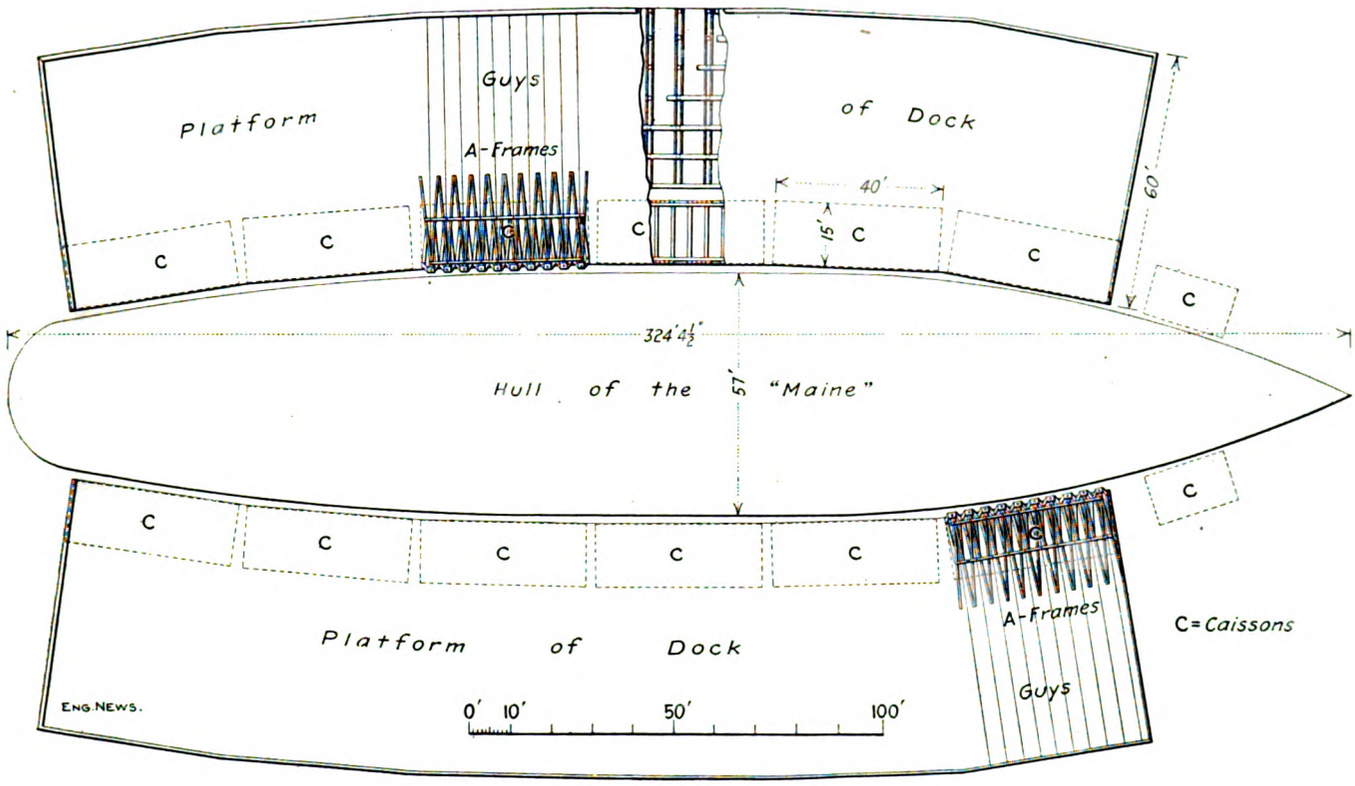


FIG. 2—PLAN OF DOCKS AND CAISSONS AROUND THE MAINE.

and carried from derricks resting on the top of these caissons. The accompanying illustrations will help the understanding of the following description. The first step will be to drive on either side of the wreck and about 20 ft. away from it, an ordinary pile and timber dock founded on straight and battered piles driven, as shown in Fig. 3, well down into the soft mud bottom of the harbor. These docks are to be some 40 ft. wide so that their outside edges will be about 60 ft. away from the sides of the vessel. The docks once built, there will be sunk in the space between each dock and the vessel a series of timber compressed-air caissons, each 15 x 40 ft. in plan. These caissons are to be sunk side by side, as drawn in the plan in Fig. 2, as near together as is possible and also as near to the side of the wreck as various projections thereon will permit. As at present designed, there are to be six of these caissons on each side, extending up to within some 60 ft. of the bow of the vessel. On account of the twisted and torn condition of the ship's frame work at this end, it is thought useless to attempt to continue the raising apparatus any farther forward, but in case it is found, after work has commenced, that such a continuation is desirable, it will be a simple matter to sink extra caissons near this portion of the wreck.

The caissons are to be of the ordinary

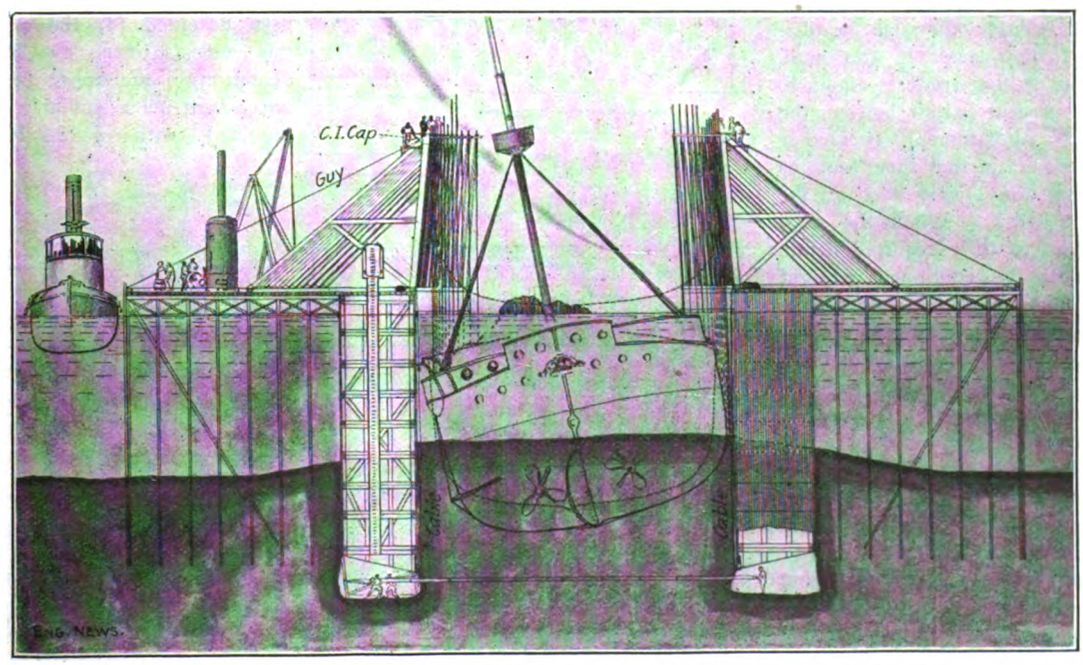


FIG. 3—SECTION THROUGH DOCKS, CAISSONS AND HULL OF MAINE SHOWING DETAIL OF RAISING DEVICE.

lapped timber construction, as shown in the section in Fig. 3, and are to be made extra strong for load transmission, as the thorough cross-bracing will indicate. They are to be made watertight so that they can be pumped dry, to the chamber

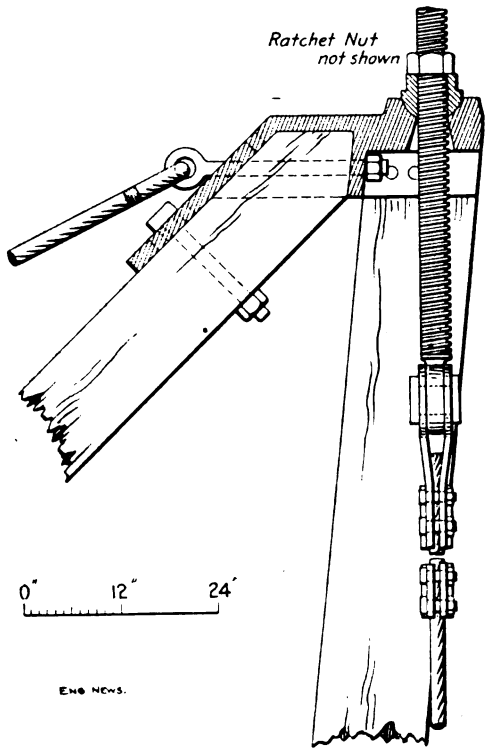


FIG. 4—DETAIL OF CAP AT TOP OF A-FRAME SHOWING SCREW DEVICE.

ceiling, but they are to be filled with water at the beginning of the operation, for reasons explained below. The caissons are built with the outer cutting edge higher than the inside to keep the escaping compressed air away from the vessel, which would otherwise be disturbed and further sunk in the mud. As the bottom of the wreck is about 10 ft. below the present harbor bottom, the caissons will be sunk some 10 ft. farther so as to make certain that their bottoms are well below the lowest part of the sunken frame work. When the caissons are driven to their required depth, the dock is to be continued straight across their tops up to the side of the wreck and is to be used as the working platform, from which to conduct all operations. On the outside face of the caissons toward the wreck there will be hung in vertical lines and spaced about every 4 ft. longitudinally, a number of wire cables stapled lightly to the wooden framing of the caisson and coiled at the upper end on the caisson top, with the lower end passing under the driving edge of the caisson and coiled in the working chamber. On one side, there are to be ¾-in. steel cables, such as are ordinarily used in construction work, and on the other they are to be at least of 2-in. plough steel with an ultimate loading capacity of 400,000 lbs.

We can now imagine the caissons sunk to their proper elevation. At every 4 ft. along the inner face of the left hand set (Fig. 2) is a ¾-in. cable coiled on top of the dock, passing down the side of the caisson, under its cutting edge into the working chamber, where it hangs coiled. On the right-hand set of caissons hang 2-in. cables arranged in the same manner. Now in the opening below the working chamber below the left-hand caisson, a 3-in. wrought iron, inside-coupled pipe is driven out into the mud, which will stand against the air pressure from the chamber, toward the opposite or right-hand caisson. Gradually, section by section this pipe is driven over until it penetrates the working chamber of the opposite caisson. Into this pipe is then led the end of the ¾-in. cable coiled in the left-hand working chamber, as a pilot cable which is to connect the two working chambers. Now, from the right-hand caisson the 3-in. pipe is drawn in, section after section removed and slipped over the connecting cable, until finally the whole pipe is taken in and the two chambers are connected only by cable through the intervening mud.

Now, the end of the ¾-in. cable in the right-hand chamber is spliced to the 2-in. cable hanging there and, by tension applied at the upper end of the ¾-in. cable at the top of the left-hand caisson, the two cables are gradually pulled up toward the bottom of the ship. First the bights around the driving edges are pulled out, then the light staples holding the cables to the caisson faces, and then the cable is pulled through the soft mud up tight against the bottom of the wreck. Pulling is continued until the 2-in. cable appears on the left-hand dock and has thus passed completely under the ship. This process is repeated for each of the cables, spaced every 4 ft., until finally there would be about 60 of these cables passing under the ship, snug up against its bottom and held securely on the solid dock on either side.

There now remains to design some method of tackle whereby these cables may be simultaneously tightened and raised, bringing, as they must if they are raised, the hulk up from the muddy bottom with them. The tackle, as now designed, is shown on the section in Fig. 3 and in detail in Fig. 4. It consists primarily of an A-frame above each of the cables, with the main mast footing on the inside wall of the caisson and with the bracing leg and the guy ropes carrying back to the dock proper. At the top of each frame is a cast iron cap, such as is shown in the detail design in Fig. 4, carrying a pack-screw system, by means of which the lifting is to be done.

The jack-screws are designed to lift more than 100 tons and the bottom end is formed of an eye-bar like that of a bridge truss, while the clamp which grips the cable ends in two similar eye-bars into which the screw is fastened with a 3½-in. steel pin (Fig. 6). This screw passes up through the cast iron cap and is provided with a ratchet-headed nut, by means of which the screw is operated. In order to provide universal motion to care for the necessary movement in the cable and also to prevent the cable from twisting during its raising, a special saddle or head has been designed for the cap. Primarily this consists of an oval cup-shaped indentation in the upper face of the cap into which fits a similarly shaped saddle, provided with a 3-9/16-in. opening, through which the 3½-in. screw passes and provided further with a flat side against which the flattened side of the lifting screw sets. The oval-shaped opening allows universal motion without twisting in a horizontal plane and the

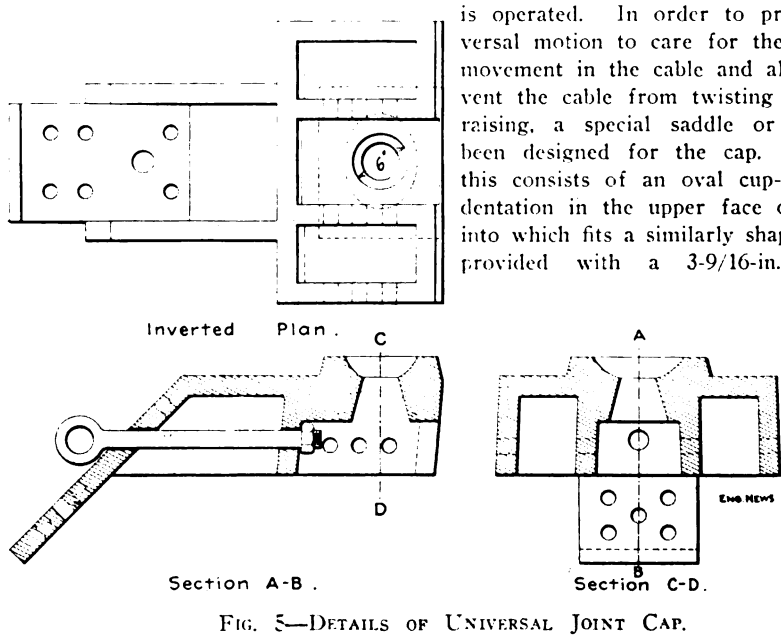


FIG. 5—DETAILS OF UNIVERSAL JOINT CAP.

flattened screw prevents the screw from turning when raising.

The method of raising the wreck has been worked out as follows: As soon as the cables are taut under the ship, but before any weight has been put upon them, the working chambers of the caissons will be filled tight with sand so as to give an even and solid bearing of the caisson on the mud bottom and then the caissons will be pumped down to such a depth that the weight of water removed will nearly equal the weight of the hulk. In this way no weight will be placed on the mud at the bottom of the caissons greater than that on them during their sinking. This water having been removed, pipes carrying compressed air or water under pressure will be forced down along the sides of the hull of the Maine in order to loosen the 12-year hold that the harbor mud has taken on the bottom and side plates of the wreck. This grip having been loosened, the lifting operation can commence.

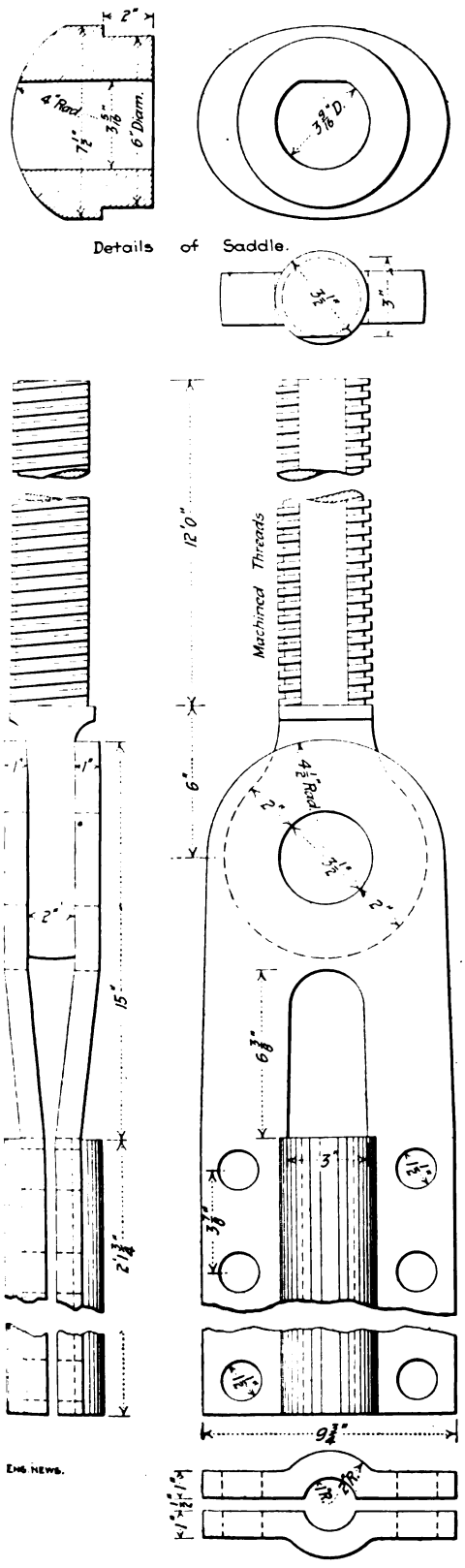


FIG. 6—DETAILS OF CABLE CLAMP, SCREW CONNECTION AND SADDLE ON TOP OF CAP.

First, the screws will be operated locally in such places as to raise the vessel to a horizontal position, both laterally and transversely, for she has settled on one side and down by the head. When this is done, the screws are all at different levels. As there is a large excess of strength in the cables and lifting apparatus, one or more pairs of screws are slacked off and the screws lected down their full length and then tensioned as before. This is repeated with all the cables until they are all ready for a full lift. Then the real lifting operation will commence. Mr. O'Rourke plans that about 1,000 men will be needed to man the jacks and suggests that the government detail a regiment of the army for that purpose. At any rate, each jack will be manned by at least eight men and, acting simultaneously on signals, these men will lift each cable through a quarter turn of the head nut, a ratchet head being provided to insure that only a quarter turn can be made at one time. Thus the whole ship may be lifted through the 10-ft. length of the screws and one by one the cables can then be relaxed, the screw dropped and then again taken up and the raising continued.

This possibility of relaxing one screw and cable at a time is one of the main features of the design. It is computed that the cables and their screws are strong enough to bear safely four times the weight of the vessel, so that, if necessary, every other one of the cables could be released at the same time and the vessel could be carried safely on the remaining half. However, it is not intended to leave so many of the cables loose at one time, but the spacing between cables, 4 ft., is quite small enough so that the two next cables, 8 ft. apart, can easily carry the load while the intervening cable is being relaxed and the screw lowered.

Once the vessel has been raised above the water, a platform can be built under her across between the two docks, and held as she is in the cable cradle, the bodies of the men can be removed, the hull examined and repaired and the vessel can be entirely refitted so as to leave Havana under her own steam.

Autogenous Welding Plants on the Pacific Coast

The Standard Boiler Works, Seattle, has recently installed a complete electric welding plant for making repairs on furnaces, boilers and ships. The plant is fitted on a barge which makes it possible for the company to do repair work quickly and at any place. A spur track leading to the company's shops has been put in, which enables them to use the same plant for the repair of locomotives and cars. This is the first electric welding plant on the Pacific coast north of San Francisco, and its success is being carefully noted. The electric welder used by the Standard Boiler Works is the German make using two points, the plus terminal being attached to the welding stick which is used to fill the fracture. Among the work already done with the electric welder are repairs to the boilers in the steamers Sampson and Argo and a number of locomotives, which has been thoroughly satisfactory.

The Commercial Boiler Works, Seattle, has recently added to its boiler shop equipment, a complete oxy-acetylene welding and cutting plant. The equipment includes a stationary plant for use in the shop and a portable plant for use outside. The Commercial Boiler Works is making a number of very extensive tests on the adaptation of this welding process to its boiler repair work, and with the addition of the oxy-acteylene welding plant, is equipped to handle all kinds of boiler building and repair of whatever size.

The Anchor Line has contracted with A. Stephen & Co., Govan, Scotland, for two freight and passenger steamers for the Glasgow, Liverpool and Calcutta trade. These vessels will be 410 ft. long, 53 ft. beam and 32½ ft. deep.

It is announced that at the recent speed trial of the new battleship Delaware an average speed of 21½ knots an hour was maintained for four consecutive hours under forced draft and 19 knots for 24 consecutive hours at normal draft.

A GRAPHICAL METHOD OF POWERING SHIPS

SIDNEY GRAVES KOON, M. M. E.

EVERY new ship is the subject of a computation to determine the horsepower requisite to drive her at the desired speed. These calculations are made in various ways, but the great majority are based on the so-called Admiralty formula, $H = \frac{D^{\frac{2}{3}} V^3}{K}$, where H is the horsepower required for speed V in knots, D is the ship's displacement in tons, and K is the Admiralty co-efficient. It is in the choice of this co-efficient that the judgment of the designer makes itself most apparent. The figure will be higher with fine models than with fuller ones; higher with moderate than with higher (relative) speeds; and very slightly higher with large ships than with smaller ones of the same form.

There is no available substitute for the judgment of the designer; but, in cases where large numbers of designs are under consideration, it is quite possible to construct curves from which the desired result in horsepower may be read off, almost at a glance. The preparation of the curves requires the calculation of a number of separate cases, but, once calculated and carefully plotted, a great saving of time enters into the determination of the horsepower for the next proposed ship. A single set of curves, based on a single assumed value of K, would obviously not fit all cases, but our equation shows us that this co-efficient enters as a direct factor; hence, if our curves are plotted on a basis of K_1, and our designer's judgment places the value for any given ship at K_2, then the result obtained from the curves, multiplied by K_1 and divided by K_2, will produce the required horsepower.

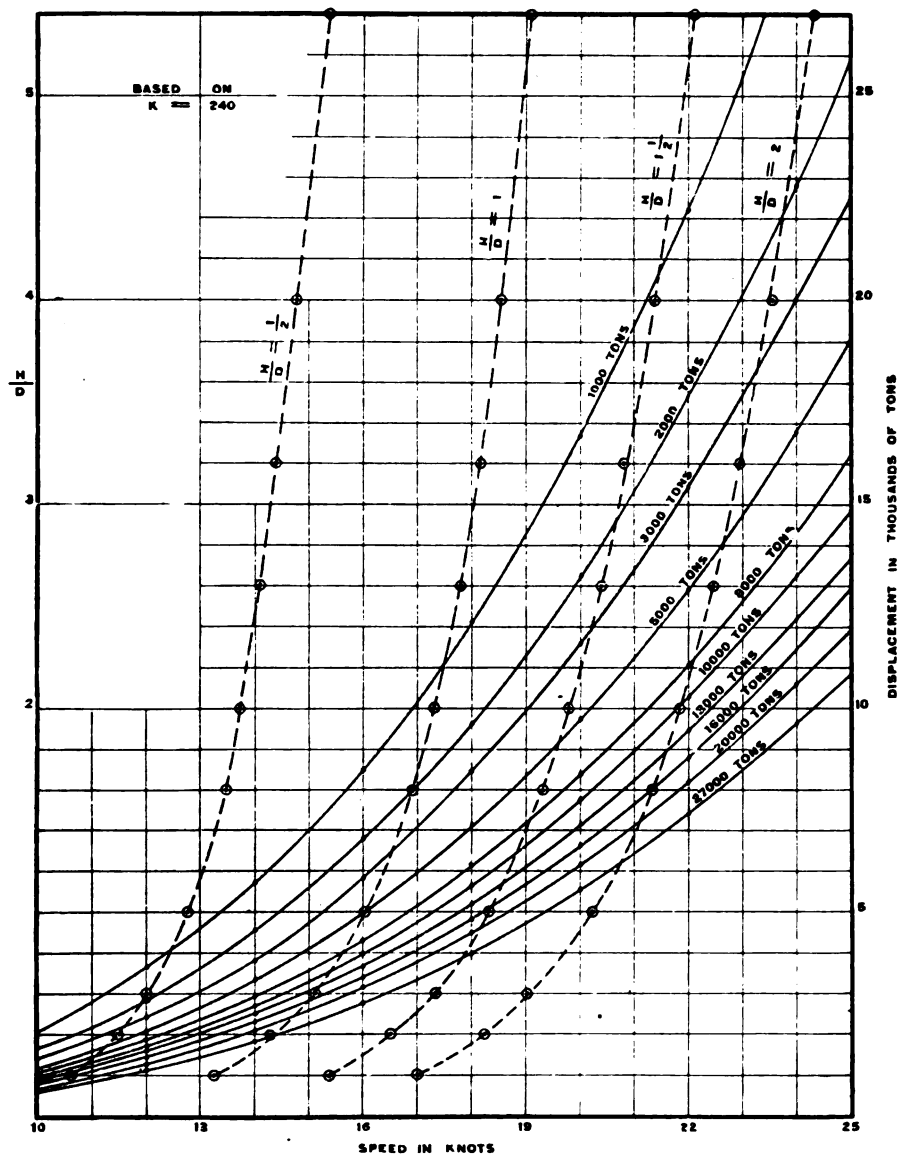


FIG. 1.

Suppose we desire the horsepower required to drive a ship of 13,000 tons displacement at a speed of 20 knots. The Admiralty co-efficient is placed at (say) 240. Then $D^{\frac{2}{3}} = (13{,}000)^{\frac{2}{3}} = 553$; $V^3 = (20)^3 = 8{,}000$; $H = \frac{553 \times 8{,}000}{240} = 18.433$. If, now, we divide H by D, we obtain 1.418 as the units of horsepower per ton of displacement.

By continuing in this manner, we may readily obtain enough information about the powers required to drive such a ship at various speeds, to be able to plot a curve in which values of H/D appear as ordinates, based on values of V as abscissae; and similarly for other displacements. Such curves, for displacements varying from 1,000 to 27,000 tons, all based on K = 240, are shown in Fig. 1. The dotted curves shown are included more as a matter of academic interest than of practical value. Each dotted curve carries a definite value of H/D, such as 1.5, through successive values of V corresponding to variations in D.

Fig. 2 shows another method of plotting the same information as is given by the solid curves of Fig. 1. Here the value of H/D is again the ordinate, but the abscissa is D, while each curve represents a definite and constant value of V, all with K = 240, as before. In some respects this is more convenient for reference than is Fig. 1.

EXAMPLES.

1.—D = 16,000; V = 21; K = 225; H = ? On Fig. 1, the curve for D =

16,000 crosses the line for V = 21 at a value which may be read as 1.55. Therefore, for K = 240, H = 1.55 × 16,000 = 24,800. But K = 225. Therefore H = $24{,}800 \times \frac{240}{225} = 26{,}453$, and 26,500 horsepower should furnish the required speed.

2.—D = 9,000; V = 18½; K = 240; H = ? By inspection (between the curves), H/D = 1.27, and H = 11,430. This ship would naturally be provided with engines designed for 11,500 H. P.

Another way of getting at cases which do not fall exactly on the lines plotted depends upon the relative rates of variation of these various elements. Our first equation shows that H varies as the cube of V, and as the two-thirds power of D. In other words, for similar-formed ships, $\frac{H_1}{H_2} = \frac{V_1^3}{V_2^3}$ when D is constant, and $\frac{H_1}{H_2} = \frac{}{D^{\frac{2}{3}}}$ when V is constant. When both D and V vary, $\frac{H_1}{H_2} = \frac{V_1^3 D^{\frac{2}{3}}}{V_2^3 D^{\frac{2}{3}}}$, with K constant.

Now, variations in both V and D may be expressed in percentages of the quantities themselves, and their effects on H computed in a very simple manner which, for all practical purposes, is sufficiently exact. If we designate by V% the percentage variation in V, and by D% that in D, we find that

$$\frac{H_1}{H_2} = (1 + 3V\%) \times (1 + 2/3D\%).$$

The simplicity of the practical application of this formula is best shown by another example:

Let D = 8,300; V = 20½; K = 240; H = ?

From the diagram, H = 1.667 D = 13,333, when D = 8,000 and V = 20. Now D% = 3.75 and V% = 2.5; therefore,

Horsepower, first approximation =	13,333
Correction for D% = (3.75 × 2/3)% =	333
Horsepower, second aproximation =	13,666
Correction for V% = (2.5 × 3)% =	1,025
Horsepower, final approximation =	14,691

With K differing from the K of our curves, another approximation would be necessary.

If we compute the horsepower directly, by means of the Admiralty formula, we shall have $H = \frac{410 \times 8{,}615}{240} = 14{,}717$.

The difference is negligible, for, as a matter of fact, the engines would in all probability be designed for 14,750 or even 15,000 horsepower.

The construction of a number of sets of curves on a large scale, each set representing a definite value of K, would involve considerable "initial" labor in computation and plotting, but the simplification which would result on subsequent calculations should pay enormous dividends on the investment.

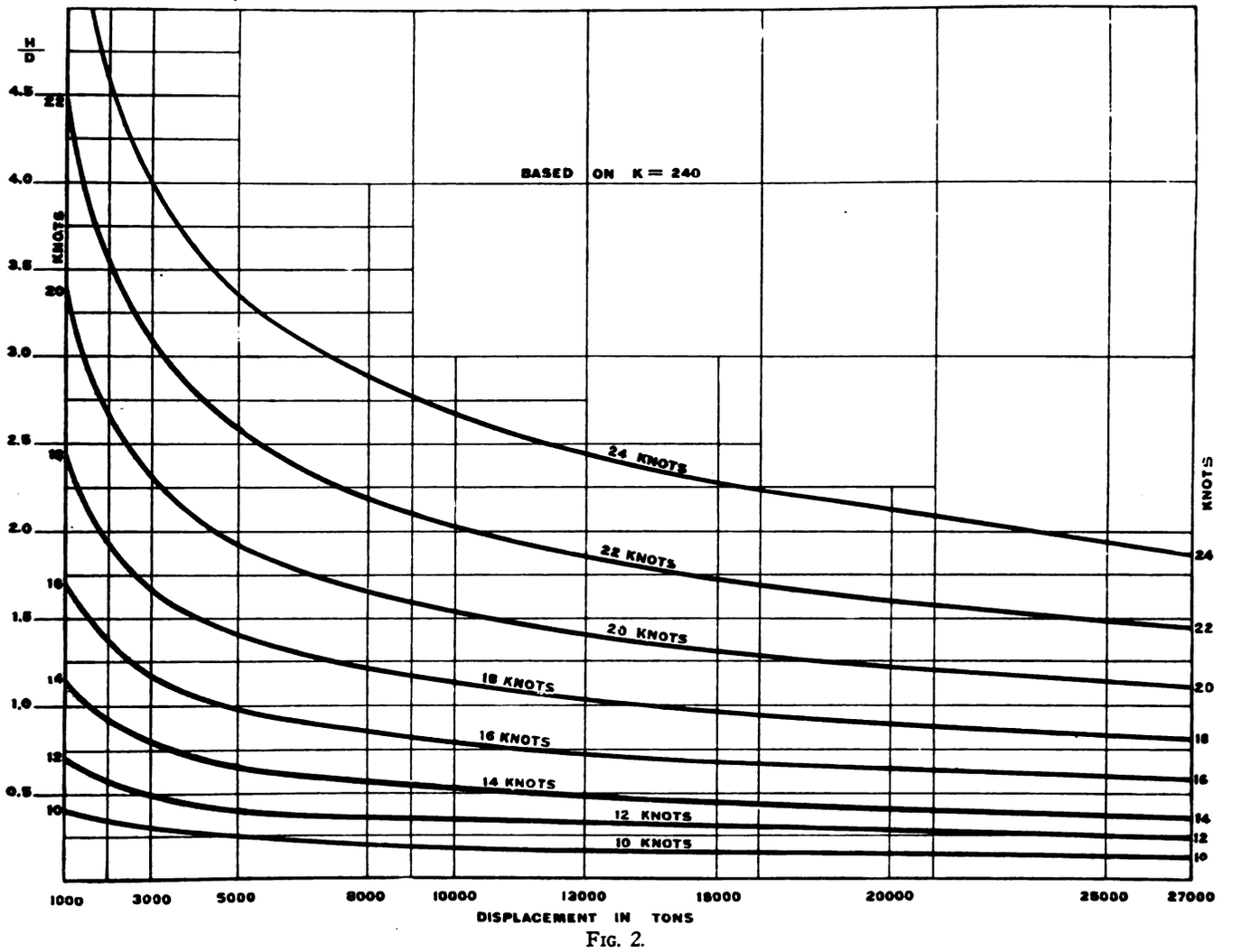


FIG. 2.

The Isthmian Canal Commission has awarded contract to William Simons & Co., Renfrew, Scotland, for a steel seagoing ladder dredge for service at the Pacific entrance of the Panama Canal at $399,340. The other bidders were: Union Iron Works, San Francisco, $874,146, and Lobnitz & Co., Renfrew, $449,000.

THE MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published monthly by

Penton Publishing Co.

CLEVELAND.

BUFFALO.....932 Ellicott Square.
CHICAGO.....1328 Monadnock Blk.
CINCINNATI.....First National Bank Bldg.
NEW YORK.....1005 West Street Bldg.
PITTSBURG.....510 Park Bldg.
SEATTLE.....942 Henry Bldg.

Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.

Subscription, U. S. and Mexico, $1.00 per annum. Canada, $1.50. Foreign, $2.00. Single copies, U. S. and Mexico, 10 cents. Elsewhere, 15 cents. Back numbers over three months, 25 cents.

Change of advertising copy must reach this office on or before the first of each month.

The Cleveland News Co. will supply the trade with the MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C., England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

September, 1910

THE MARINE REVIEW can be found on sale at the following news stands:

E. J. O'Connor, 2 Ohio st., Buffalo.
R. J. Seidenberg, Ellicott Sq., Buffalo.
J. H. Fleming, Chamber of Com., Buffalo.
Postoffice News Co., 178 Dearborn st., Chicago.
Frank Morris, 165 Wabash av., Chicago.
James Dunne, C. N. W. depot, Chicago.
Wayne Hotel, Jefferson and Third st., Detroit.
Robert Schram, 115 Woodward av., Detroit.
Geo. W. Sharpe & Co., 138 Griswold, Detroit.
Frank Kleinschmidt, 652 Broadway, Gary, Ind.
K. Kramer, Produce Exchange bldg., Toledo.
Board of Trade News Stand, Boston, Mass.
Revere Beach and Lynn News Stand, 350 Atlantic av., Boston, Mass.
Rowe's Wharf News Stand, Atlantic av., Boston.
Staub's News Emporium, Exchange alley and Canal st., New Orleans, La.
Hollei's News Stand, Commercial place, New Orleans.
Hill's News Stand, Charles, near Canal st., New Orleans.
J. Fine, Produce Exchange bldg., New York.
Wm. Farrell, Battery pl. and Greenwich st., New York.
J. Fuchs, 17 Battery pl., New York.
Navy Yard News Stand, 1116 Eighth St., Washington, D. C.
New Willard Hotel, Washington.
Becker & Orndorff, 1427 Pa. av., Washington.
C. F. Willersen, Washington st., Marquette.
Pelissier's News Stand, Front st., Marquette.
Lenox Hotel News Stand, Duluth.
Spalding Hotel News Stand, Duluth.
Edward M. Stone's Book Store, Duluth.
Ferninand Ohlendorf, Galveston.
Purdy Book Store, Galveston.
Charles Deferner, Galveston.
Weber & Plum, Seattle, Wash.
Lowman & Hanford, Seattle, Wash.
Standard Book & Stationery Co., Victoria, B. C.
F. LeRay, 1306 Government st., Victoria, B. C.
Thompson Stationery Co., 325 Hastings st., Vancouver, B. C.
Central News Co., 916 Pacific av., Tacoma.
Oregon News Co., 147 Sixth av., Portland, Ore.

The Navy

In its contention that there should be no navy without a merchant marine, THE MARINE REVIEW is not to be considered as opposed or inimical to our navy, for the contrary is the fact, but as emphasizing the incongruity of having a large and powerful fleet and no ocean-borne commerce for that fleet to defend. As Mahan says,[1] *"The necessity of a navy springs therefore from the existence of a peaceful shipping and disappears with it except in the case of a nation which has aggressive tendencies and keeps up a navy merely as a branch of the military establishment."* Every authority on naval matters makes the existence of a sea-borne commerce the condition precedent to the establishment of an armed fleet.

Napoleon's greatest efforts were put forth to cripple, not England's navy, but her commerce, hence the growth and wonderful efficiency of that navy. Hence with no merchant marine a navy is without justification, and money spent therefor is literally cast into the sea. The REVIEW hopes to bring this astounding, not to say humiliating, condition of affairs home to the people, that they may force their representatives in congress to immediate action which shall prove both effective and lasting as a remedy.

The REVIEW has expressed its opinion as to the management and operation of the fleet and it frankly recognizes the efforts now making to secure economy in certain branches of expenditure on board ship, such as competition in fuel consumption, and the substitution of the general store system afloat for the wasteful and indefensible semi-annual allowance which resulted in filling the store rooms with unused material to be landed at the end of the cruise, reappraised, at heavy loss, or else thrown on the dump as valueless through deterioration. The REVIEW is glad to see an awakening on the part of sea officers to the importance of saving at all points in order that a larger share of the naval appropriation may be available for purposes either of war or of preparation for war and it would be the last to stint the navy in those outlays which are requisite for maintaining a state of readiness that is half the battle. Whether or not our ships are equipped with many things that might well be dispensed with at no sacrifice of actual comfort or of fighting qualities is another question into which it is not necessary to enter at this moment. In general terms the REVIEW respects and honors the men on board our battleships who are so faithfully laboring for efficiency, so anxious to fit themselves and their weapons for any demand the country may impose.

The navy ashore stands in a totally different category. The department at Washington, the various shore stations, navy yards, gun factories, and what not, should exist solely for the upkeep of the fleet. That is so self-evident as to need no demonstration, yet we find, on examination, that these numberless establishments owe their origin and development, in too many cases, to causes with which the fleet has no concern. On no possible ground of public welfare can the re-opening the navy yard at Portsmouth, N. H., be justified in view of its proximity (60 miles) to that at Boston; nor the founding of one at Charleston, S. C., where the water approaches forbid the entrance of a deep draught vessel or a wounded man-of-war unduly immersed at bow or stern. A probable explanation may be found in the presence on the Senate naval committee of two powerful politicians from the state mentioned.

One of the ablest writers on naval matters, Admiral Sir Cyprian Bridge, R. N., lays down the rule under this head in unmistakable and timely words:

"The general principle to be followed in the case of dock yards and similar government establishments is to form and keep them on the smallest scale compatible with real requirements. No portion of the naval expenditure of a country should be scrutinized more closely or incurred with greater reluctance than that devoted to their creation and expansion. Where the resources of a country admit of recourse to private industry, the desirability of permitting an overflow of work from the government establishments to the latter should exert unceasing influence upon naval

[1] The Influence of Sea Power Upon History.

policy. This leads up to the statement of another principle. The number of government establishments of the kind in question should be kept as small as possible. What is wanted is, not the most we can get, but the fewest that we can manage to do with. This should be axiomatic."*

In these sentences are all the law and the prophets, yet how atrociously have we violated the former. The present administration cannot be absolved from guilt in this connection, for one of its first acts was to reopen the yards at Pensacola and New Orleans which Secretary Newberry had wisely closed. It is questionable whether there should be more navy yards on the Atlantic coast than three, at New York, Philadelphia and Norfolk; on the Gulf coast one, and on the Pacific coast, two. The latter are badly placed, for the Bremerton yard ought to be at Seattle and the Mare Island yard at San Francisco. How much money might be saved by shutting up the unnecessary yards, by concentrating work in a few, well appointed and economically administered, and by utilizing private plants for the surplusage cannot be accurately estimated, but that the turn would greatly reduce the annual naval appropriation cannot be denied. It would only be fair to the navy afloat to rid it of a reproach under which it now suffers but from which it derives absolutely no benefit. Extravagant as our ships are in cost and maintenance, due chiefly, as the REVIEW has already pointed out, to lack of intelligence and co-operation in design and to totally unnecessary features of equipment and however true it is that the naval appropriations are out of all proportion to the results as embodied in the fleet it is also true that no inconsiderable proportion of these sums goes to maintaining wholly needless shore stations clamoring every year for huge expenditures in "improvements" that are not wanted and in supporting a large administrative staff for doing little work that is of real value to the ships. In this direction lies an almost limitless field for retrenchment and reform. But what will the politicians say to such a proposition?

*The Art of Naval Warfare, p. 51.

Our Trade with South America

Consul-General R. M. Bartleman has made a very significant report to the state department on the growth of Argentina shipping facilities with Europe and, among other things, he says:

During the first five months of 1910, not a single merchant vessel flying the American flag has entered the port of Buenos Aires. We are obliged to ship our products to Argentina under foreign flags. Other shipping interests have improved the opportunity of turning the greater interest of the United States in Latin America to strengthen their fleets and to reap the fruits of what we have sown. It is said that the Lamport & Holt line is to place a new passenger steamer on the New York-Buenos Aires route that will be even finer than its new 12,000-ton Vasari, and, if so, the tribute that American exporters will have to pay to foreigners for carrying their goods will be greater than ever. Why not remember that as a strictly business proposition, this Lamport & Holt service between New York and the east coast of South America has succeeded and can't some United States service do likewise?

A line could succeed on a strictly business proposition, if some of the handicaps under which the American ship operates on the high seas could be removed. To begin with, it costs more to build a ship in the United States than it does abroad, and then it costs more to operate her after she is built—and of these two the latter is the more important. The plane of living in the United States is higher than in any other country. That is admitted by all nations. The tariff is horizontal in its application and has elevated the rewards of nearly every industry within the borders of the United States; but it has stopped short of the ship, and that is what is the matter with the American ship. It has to operate unprotected on the high seas while bearing the unequal burden of higher cost without receiving any compensating advantages whatever. It carries upon the high seas the same plane of living that obtains on land and has to maintain a food scale that is the most abundant among nations. No real American can quarrel with this condition, for it is a part of the creed of the American people that they shall have the best there is to be had. But this superior scale must be met somehow and it can be met only by definite and direct support. The Humphrey ocean mail bill, projecting lines to South American ports, was one of the most sensible and practical measures ever devised to give the American ship a fighting chance to gain South American trade. When the American ship has once established trade routes to South America and American business men have developed trade connections there, the American ship will not have much trouble in holding its own with the ships of other countries that now so completely control South American trade.

It is a surprising thing that unfair conditions have been permitted to continue so long. It has been pointed out over and over again that the great market lying south of us, a part of our own hemisphere, has been almost completely monopolized by foreigners. It is a shameful thing that not a single American merchant vessel has visited the port of Buenos Aires so far as reported this year. The policy that permits such a thing to happen is certainly a short-sighted one. How can we expect to develop trade with the South American countries unless we are self-contained as to the means of reaching them? We are permitting the nations of Europe to dominate absolutely the trade of the South American countries to their great pecuniary profit. Unless our fiscal policy is promptly changed there will not be a single American ship to pass through the Panama canal when it is completed. This great ditch will have been dug for foreign ships. It ought to open a convenient roadway from the work shops of the Atlantic coast to the consuming populations of the west coast of South America, but what it will actually be will be a route from Europe to them.

Attention has been called to this vital defect on numerous occasions. It was one of the points most forcefully emphasized by Secretary Root when he returned from his tour of the South American countries a few years ago and which caused him to make a most earnest appeal for government aid for the American ships. If our for-

eign shipping operates under the artificial handicap imposed upon it by the tariff it should be artificially removed.

A little while ago, Mr. Stewart, second assistant postmaster general, complained about the inadequacy of mail facilities to South America. All of our mail is carried to South American cities in foreign ships over which the postoffice department has absolutely no control. There is no regularity in sailings. Schedules are subject to change without notice, resulting in a frightful impediment to business. It seems absolutely ridiculous that a nation of 90,000,000 of people should suffer such a condition to continue. Our prosperity depends upon getting rid of our surplus products. The only way to get rid of them is to export them, and why on earth we permit foreign nations to absorb one of the richest fields, lying practically at our door, is one of the things that is impossible to understand. It is certainly folly.

Prize Problems of Great Lakes Engineering Works

The Great Lakes Engineering Works exhibited at the Detroit Industrial Exposition a model of the bulk freighter, William P. Palmer, building on the Isherwood system of construction for the Pittsburg Steamship Co. The company offered three prizes to the school children of Detroit for correct answers to six problems based upon the following particulars:

The dimensions of the steel bulk freight steamer, William P. Palmer, are as follows: Length over all, 607 ft.; length on keel, 580 ft.; beam, moulded, 58 ft.; depth, moulded, 32 ft.; height from keel to top of pilot house, 63 ft. 3 in.

The total weight of materials entering into the construction of this steamer is 9,886,000 lbs.; materials consisting of steel, iron, brass, copper, etc.

The total number of steel rivets required in the construction of this steamer is 700,000. The number of punched holes in the hull of the steamer is 1,750,000; this number being necessary for the number of rivets mentioned.

When floating light without any cargo, she displaces 4,943 short tons; when loaded to her limiting draught of 19 ft., she displaces 17,555 short tons.

The internal capacity of the ship, acceptable for the storage of cargo, is 496,800 cu. ft. A difference of 80 tons of cargo makes a difference of 1 in. in the draught when the vessel is floating at the load draught.

The problems, correctly answered, were as follows:

Problem No. 1.—What weight of iron ore can she carry on a draught of 19 ft.?

Answer:—Number of short tons, 12,612.

Problem No. 2.—When filled completely with a cargo of coal, which occupies 40 cu. ft. to the ton, what weight of coal can she carry? Will her draught be 19 ft.? If not, what will it be?

Answer:—She will carry 12,420 short tons. Her draught will be 18 ft. 9.6 in.

Problem No. 3.—When filled completely with wheat, weighing 60 lbs. per bu., how many bushels of wheat can she carry? Will her draught be 19 ft., and if not, what will it be?

Answer:—She will carry 399,214.3 bu. Her draught will be 18 ft. 4.1 in.

Problem No. 4.—Supposing a farm produces 25 bu. to the acre, what size farm is it necessary to fill the ship for one voyage?

Answer:—A farm of 15,968.5 acres.

Problem No. 5.—If one cu. ft. of iron ore weighs 140 lbs., what percentage of the total cargo space does the iron ore occupy when ship is loaded to 19 ft. draught?

Answer:—The iron ore occupies 36.2 per cent.

Problem No. 6.—If the engines of the ship are 2,000 h. p., and the speed is 11½ miles per hour, and length of the voyage 1,000 miles, and it requires 1.6 lbs. of coal for every h. p. per hour, what will be the cost of the coal for the voyage if the price of same delivered in the coal bunkers of the ship is $3.00 per net ton?

Answer:—Coal for one voyage will cost $417.39.

The winner of the first prize, amounting to $50.00, was Grace Cantelo, Farrand school, age 13 years; second prize, $25.00, W. W. Raymond, Central High, age 16 years; third prize, $15.00. Prescilla Dillaway, Central High, 16 years old.

The judges were: Prof. H. C. Sadler, Prof. M. E. Cooley and Sidney R. Russel.

John A. Donaldson's Promotion

John. A. Donaldson, of the Pittsburg Coal Co., was, on Aug. 11, appointed president of the Monongahela River Consolidated Coal & Coke Co., with headquarters at Pittsburg.

James H. Wood, district sales agent for the Pittsburg Coal Co., was promoted to Mr. Donaldson's old position as manager of lake shipping and fuel department of the Pittsburg Coal Co. Mr. Donaldson left immediately for Pittsburg. He had been connected with the lake coal trade for about 17 years, and was probably the most popular man in the business on the lakes. He came to Cleveland as the representative of the Pittsburg & Chicago Coal Co., but when the Pittsburg Coal Co. was organized, taking over a number of firms, he went with it as general agent. In 1902 he organized the National Fuel & Dock Co., which was later sold to the Pittsburg Coal Co.

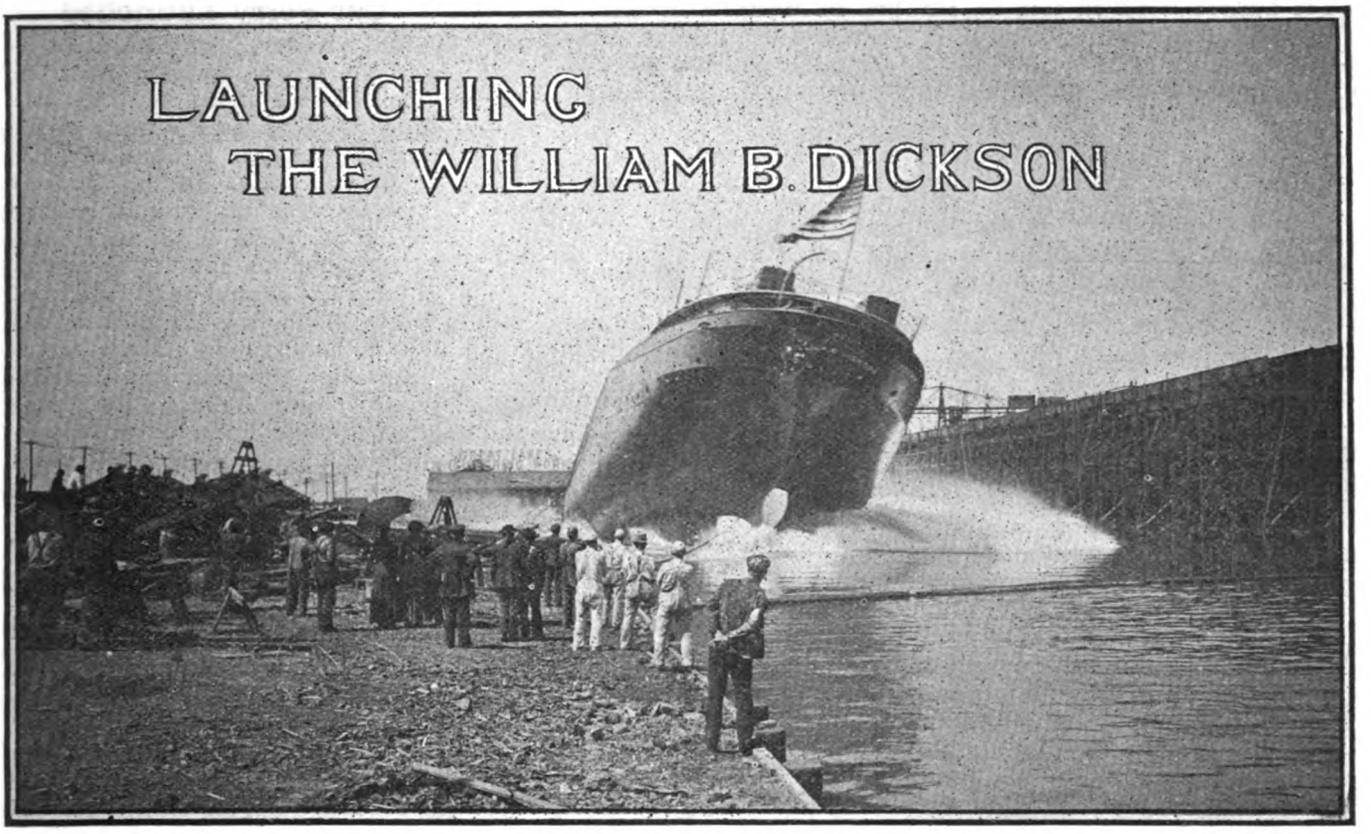
The Monongahela River Consolidated Coal & Coke Co. is one of the largest producers of coal in the Pittsburg district, operating a large fleet of steamers and barges and having 42 producing mines. Its annual output of coal is about 8,000,000 tons, of which amount about 1,500,000 tons comes to the lakes.

Captains Suspended

Local Inspectors Stewart and Van Liew, at Port Huron, who investigated the circumstances surrounding the collision between the steamers James B. Wood and Frank H. Goodyear, whereby the Goodyear was sunk with a loss of 18 lives in Lake Huron, on May 23, have found both vessels equally guilty in that they were running at full speed during a heavy fog. The license of Capt. T. D. Gibson, of the steamer Wood, was revoked. Capt. R. F. Hemenger, of the steamer Goodyear, was suspended for 60 days, and Donald McLachlan, mate of the Wood, was suspended for 30 days. The finding is that Capt. Hemenger, of the Goodyear, violated Rule 15, which requires that vessels shall go at moderate speed during a fog. Donald McLachlan, of the Wood, was also found guilty of violating Rule 15. Capt. Gibson, of the Wood, is held to have violated Rule 2. The inspectors hold that if either rules had been observed the collision could not have occurred.

Unloading Record

A record was made by the four 15-ton Hulett electric machines at Ashtabula on Aug. 5 in unloading 11,131 gross tons of ore from the steamer Thomas F. Cole in four hours 30 minutes, net time, at the rate of 630.6 gross tons per machine per hour. The Cole arrived at Ashtabula at 10:53 a. m., and left at 5 p. m., making the total time at dock six hours and seven minutes, which included one hour for dinner. All the ore was unloaded direct into cars with no damage to the vessel. The machines handled 598.2 gross tons to 671.4 tons per hour, making the average 630.6 tons per hour for each machine.



LAUNCHING THE BULK FREIGHTER WILLIAM B. DICKSON AT THE ECORSE YARD OF THE GREAT LAKES ENGINEERING WORKS.

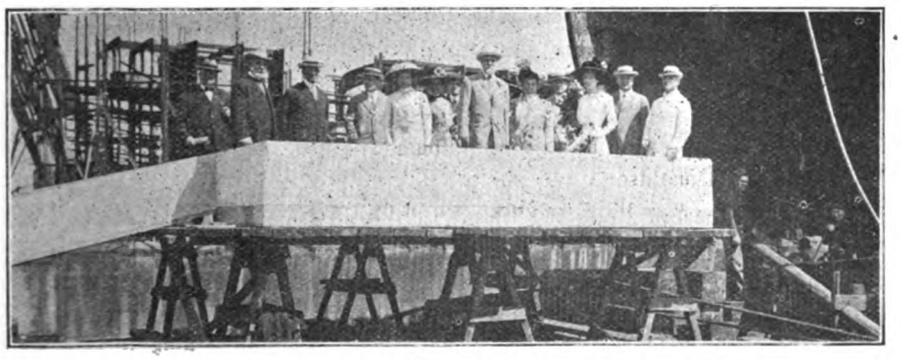
THE bulk freighter William B. Dickson, building for the Pittsburgh Steamship Co., was launched from the Ecorse yard of the Great Lakes Engineering Works on Saturday, Aug. 27. She was named in honor of the first vice-president of the United States Steel Corporation and was christened by his daughter, Miss Emma Young Dickson, of New York.

This is the second of three freighters under way at this yard for the Pittsburgh Steamship Co. to be launched. The W. J. Olcott was launched some time ago and the William P. Palmer will be launched in a few weeks. Quite an event was made out of the launching, the Great Lakes Engineering Works chartering the steamer Pleasure to take the launching party to the ship yard. About 300 persons saw the vessel go overboard, and as is usual at lake yards, the launching was successful in every way. The launching party was subsequently entertained at luncheon at the Detroit club and with an automobile trip throughout the parks, though this latter feature had to be somewhat curtailed, owing to the necessity of Mr. Dickson's return to New York the latter part of the afternoon.

Harry Coulby, president and general manager of the Pittsburgh Steamship Co., acted as toastmaster at the luncheon. After proposing a toast to the sponsor he introduced Mr. Dickson, who spoke briefly upon industrial affairs. He admitted a lull in trade but regarded it as only temporary. Mr. Coulby then introduced Antonio C. Pessano, president and general manager of the Great Lakes Engineering Works, who expressed his pleasure at the optimistic views of Mr. Dickson and thought the country could not do other than go ahead. "Its progress must," he said, "continue to be onward and upward."

President William Livingstone, of the Lake Carriers' Association, upon being introduced gave a few illuminating facts regarding lake commerce, saying that for every minute of the twenty-four hours of the day, 228 tons of freight pass over the Limekiln crossing. He was confident that the great strides of the past would be more than equalled in the future.

John P. Whelan, the collector of the port, also spoke briefly. In the launching party were: Mr. and Mrs. Wm. B. Dickson, Misses Emma, Susie and Eleanor Dickson, W. B. Taylor and Miss Stella Taylor, of New York; H. G. Dalton, E. C. Collins, Cept. John Mitchell, John Scott, F. B. Smith, L. Hausheer, of Cleveland; Antonio C. Pessano, H. W. Hoyt, William Livingstone and Mr. and Mrs. John B. Whalen, of Detroit.



THE DICKSON LAUNCHING PARTY ON THE LAUNCHING STAND.

The Dickson is 600 ft. over all, 580 ft. between perpendiculars, 58 ft. beam and 30 ft. deep.

She will carry about 12,000 tons of ore on favorable draught. She will come out in about a fortnight and will be commanded by Capt. A. P. Chambers.

Isherwood Rights for the Great Lakes

PRESIDENT James C. Wallace, of the American Ship Building Co., announced upon his return from England, on Aug. 20, that he had closed a deal on behalf of the American Ship Building Co., for the rights to the Isherwood or longitudinal system of construction of vessels on the great lakes. The company will during the winter construct at its Lorain yard a 10,000-ton steamer upon this system, to be ready at the opening of navigation next spring. There is one steamer now building on the great lakes under this system, the William P. Palmer, at the Ecorse yard of the Great Lakes Engineering Works. While she will be launched this fall, she will not go into commission until next spring.

Before the Pittsburg Steamship Co. definitely concluded to build the Palmer upon this system J. W. Isherwood, the designer, and C. Buchanan, Lloyds assistant chief ship surveyor, and James H. Mancor, Lloyds chief surveyor for the United States, spent several weeks on the lakes.

Mr. Wallace's announcement that the American Ship Building Co. has become the licensed agents for this system of construction on the great lakes is of far-reaching importance. It is not to be understood, however, that the other shipyards on the lakes may not build vessels upon this system. They can do so by paying royalty to the American Ship Building Co. Mr. Wallace stated that the American Ship Building Co. had no disposition to monopolize the rights of this form of construction on the lakes, but had, as a simple business proposition, become its licensed agents for the great lakes. Mr. Wallace has apparently returned from England a thorough believer in the system. He found the English builders, notably Sir W. G. Armstrong, Whitworth & Co., and J. L. Thompson & Sons of Sunderland enthusiastic about the type.

The chief advantage of this system for the lakes, according to Mr. Wallace, lies in the fact that it allows a better distribution of metal than is possible under the transverse system, making a lighter and stronger ship. He thinks there is no question whatever that it will eventually supersede the transverse type on the lakes, and thought it prudent, therefore, to secure the Isherwood rights for the Great Lakes promptly. He estimates the type to save 10 per cent of the hull or launching weight and would therefore have that much greater carrying capacity. The Palmer, now building at Ecorse, will have 384 tons less steel in her than the Dickson, just launched. In other words, she will carry 384 more tons of ore. This would mean that during a full season such a ship would carry an extra load, provided, of course, she carried a full cargo each trip.

There are fifty-two steamers either built or building under the Isherwood system. Sir W. G. Armstrong, Whitworth & Co. are now building three for the Dominion Iron & Steel Co. Blom & Voss of Hamburg are also building some. The Newport News Ship Building & Dry Dock Co., and the Maryland Steel Co. also have orders for vessels upon this system.

The Isherwood system was described in THE MARINE REVIEW, June 4, 1908. Briefly, the closely spaced transverse ribs are omitted and the transverse strength is obtained by fitting on the shell and deck plating a series of strong transverses at widely spaced intervals. These transverses extend completely around the sides, bottom and deck of the ship and are slotted to allow of longitudinal frames and beams being fitted continuously throughout the transverses.

No topic among vessel owners, ship builders and naval architects has been more widely discussed along the lakes during the past fortnight than this one and the general opinion is that Mr. Wallace has made a very shrewd move, though architects are, by no means, a unit as to the advantages of the type for the lakes.

Car Ferry Launched

The car ferry, Marquette & Bessemer No. 2, was launched from the Cleveland yard of the American Ship Building Co., on Sept. 3, being christened by Miss Loiz E. Scott, daughter of John R. Scott, of the Carnegie Steel Co. The car ferry is building for the Marquette & Bessemer Dock & Navigation Co. and will be operated between Conneaut and Port Dover. She is 350 ft. long, 56 ft. beam and 19½ ft. deep, having capacity for 30 freight cars. She has two triple-expansion engines, cylinders 19, 35 and 52 in. diameter by 40-in. stroke, supplied with steam from four Scotch boilers, 13 ft. 9 in. diameter and 12 ft. long. The launching party were given a luncheon at the Union Club by the ship building company. This concludes the program of launchings by this company for the present year.

A. A. Schantz

On Saturday, Aug. 13, A. A. Schantz, general manager of the Detroit & Cleveland Navigation Co., celebrated the thirtieth anniversary of his connection with the line. In his honor a dinner

MR. A. A. SCHANTZ.

was given, at which there were 13 guests and 13 courses. During the 30 years with which Mr. Schantz has been associated with this company, many changes have taken place; the company has grown from a small one to a great one, and much of the credit is due to Mr. Schantz. He has exemplified the biblical injunction to do with all his might whatever his hand findeth to do. His career is a marked example of the success that comes from pitching into

things. It never made much difference to Mr. Schantz what his job was, he was always willing to do whatever was to be done—whether it was hustling baggage, selling tickets, writing folders, it was all in the day's work for him. Mr. Schantz doubtless had an inherent liking as a youngster for the transportation business. When he was a boy in Mansfield, he ran an excursion to Dayton on his own responsibility, hiring the train and billing the town and actually clearing a few dollars. A trip up the lakes determined him as to his life work. He applied for the position of local agent of the Detroit & Cleveland Line at Detroit and got it, passing successively to the positions of traveling passenger agent, general western traveling agent, assistant general passenger agent, general passenger agent and general superintendent and passenger traffic manager. In 1902, he was made a member of the board of directors, and in 1907 general manager.

Repairs to Zenith City

Repairs on the steamer Zenith City, which went on the rocks off Point Au Sable, Lake Superior, on July 28, were completed at the yard of the Toledo Ship Building Co. on Aug. 24. While the boat was in dry dock 57 plates from 14 ft. to 28 ft. in length were removed, 17 new plates were put on, six plates were faired in, 131 channel floors were cut out and the majority replaced with new channels, including connections. The work was completed in 17½ days actual time in dry dock. The steamer was docked on Thursday, Aug. 4, and was out of dock Aug. 24. The Pittsburg Steamship Co. complimented the Toledo Ship Building Co. upon the expedition displayed in this work.

Lake Trade

The season of 1910 will end very quietly on the great lakes. The Pittsburg Steamship Co. has notified the owners of its chartered tonnage that it will be through with the ships on Oct. 15. This will release a fleet having capacity to move about 15,000,000 tons in a full season. There will be little for these ships to do for the balance of the season, as a considerable fleet has already been laid up. The Pittsburg Steamship Co. will retire its own ships on Nov. 15, so that the season on the great lakes will have ended well before Nov. 30. There will be a gradual closing down during November, and many vessels will go into winter quarters earlier than usual. Of course, this program means that not as much ore will be forwarded during the fall months as was expected. In fact, it is not likely that as much will be forwarded from Sept. 1 to the close of navigation as was moved during that period last year. However, the movement for the full season will be safely in excess of that for 1909.

The fleet moved during August 6,964,381 tons, which is 19,092 tons more than were moved during July, notwithstanding the fact that some of the vessels carried their August requirements during July. The movement to Sept. 1 totals 28,827,029 gross tons, an increase of 6,238,480 tons over the movement of 1909. After Sept. 1 last year the fleet moved 19,095,531 tons. Should this record be maintained for the balance of the season the fleet will have moved 47,000,000 tons, but it is not expected that much more than 15,000,000 tons will be moved from Sept. 1 to the close this year, making the total movement for the season between 44,000,000 and 45,000,000 tons. The summary of shipments by ports during August is as follows:

Port.	August, 1909.	August, 1910.
Escanaba	1,037,341	697,412
Marquette	542,697	525,898
Ashland	639,581	645,107
Superior	1,110,213	1,332,284
Duluth	2,279,242	2,382,156
Two Harbors	1,584,215	1,381,524
	7,193,199	6,964,381
1910 decrease		228,818

Port.	To Sept. 1, 1909.	To Sept. 1, 1910.
Escanaba	3,053,845	3,162,271
Marquette	1,413,568	2,249,774
Ashland	1,700,769	2,878,971
Superior	3,686,323	5,227,687
Duluth	7,713,377	9,823,644
Two Harbors	5,020,667	5,484,682
	22,588,549	28,827,029
1910 increase		6,238,480

Vessel owners are relieved that the underwriters have reached an agreement not to charge excess insurance for winter mooring in the outer harbor at Buffalo. Vessels will be moored under the supervision of underwriters about 200 ft. apart, bows to the breakwater, with two anchors and plenty of chain out.

Alex. Johnston, deputy minister of marine and fisheries, Ottawa, opened bids on Sept. 1 for the construction of a twin screw steel lighthouse and buoy steamer to be delivered at Victoria, B. C. The steamer will be 200 ft. long, 38 ft. beam and 17 ft. 6 in. deep.

Port of Portland Harbor

Some interesting facts are available on the work of the bar pilots of the Port of Portland. Portland probably has done more to improve its harbor than any other city of its size in the United States. The Port of Portland (fully described in THE MARINE REVIEW, May, 1909, took over the bar pilotage and river towing about a year ago. There are a number of independent pilots who compete with the commission tugs. The situation at the mouth of the river is such that the independent marine guides can compete with the Port of Portland solely in the steamer trade. Sailing vessels must be given towage and the Port of Portland has tugs and other facilities for that work which the independents lack.

To secure business the independent pilots have, in several instances, traveled to San Francisco, Puget Sound, and British Columbia, which increased their disbursements. On the other hand, they have no equipment to maintain, which is in one way an advantage but a handicap in another, because it precludes them from regularly meeting vessels off the river when no previous arrangement has been made to meet them at a coast harbor. In some cases the independents have brought steamers into the river and the commission pilots brought them into the harbor, but any moves necessary in port were performed by the river pilots, assisted by the tow boats of the Port of Portland, and often the commission's pilots guided the craft over the bar on their return to sea. In either event, the commission reaped a small revenue from the harbor moves, which average $25 each.

There is no competition with the steamers of the Portland & Asiatic Steamship Co., because the Port of Portland secures that revenue on a provision of the tariff through which a reduction of 25 per cent is allowed when 12 or more steamers are operated out of the river each year. Any other line is privileged to take advantage of the same concession. The independent pilots handled 23 vessels during the year, totaling $5,112.52 for pilotage. The fleet secured by the Port of Portland numbered 32 vessels and the pilotage totaled $6,941.06. A number of ships have crossed the bar at the mouth of the Columbia without a pilot other than her master. The Port of Portland has given instruction to rush work on the pilot schooner Joseph Pulitzer and the bar tug Wallula at the Willamette Iron & Steel Works.

Pilotage rates were cut in half at the last meeting of the Port of Portland commission. The old tariff was $5 on each foot of a vessel's draught, and 2 cents per ton on her net register tonnage. The new rate is $2.50 per foot and 1 cent per ton. The reduction was made to drive the independent pilots out of business.

REASONS FOR A CANAL FROM LAKE ERIE TO LAKE MICHIGAN

P. C. RANDALL, in the *Industrial Magazine.**

MY ATTENTION has has been called to an extended account of a speech made by Howard I. Shepherd as president of the Chamber of Commerce, of Toledo, on the question of inland waterways, and also to your editorial comment commending the same. As I have been an ardent advocate of the Michigan and Erie canal and have twice advocated it in public speeches in your city, I want to take issue with Mr. Shepherd on the subject of the practicability of this canal and with the subject of inland waterways in general.

Mr. Shepherd says that large vessels could not go through the Michigan and Erie canal at a speed of more than four miles an hour, and that lake vessels could make the distance from Chicago to Toledo by lake quicker than they could by the canal. I grant this is true. No one advocates the Michigan and Erie canal as a ship canal. It is foolish to talk of this canal and of the Miami and Erie canals as ship canals. These canals, and in fact the whole system of inland waterways, for that matter, must be for barges and not for ships. There is no draw-back to this, as there is no shipping in the world so cheap as that by barges and barge fleets. This has been demonstrated on the canals and canalized rivers in France and Germany. In the first place, the cost of the vessels is much cheaper and the cost of propulsion much less. The average cost of carrying a ton on the Ohio river, including the return of the empty barges, is but one-third of a mill per ton mile, and I am told that the cost in Germany on the larger streams is no more. The distance from Chicago to New York harbor by the Michigan and Erie canal, Lake Erie and the Erie canal is a little over 1,000 miles. Over half of this distance is in the state of New York, as by the Erie canal and the Hudson river it is 520 miles from Buffalo to New York. This, one-half the distance from Chicago to New York, will be for barges and not for ships, and would seem to determine the kind of vessels that should be used between Buffalo and Chicago. If barges are to be used for the entire distance, then why make the great detour of the lakes and travel between 800 and 900 miles farther on each round trip than is necessary? Granted that no time would be saved in going through the canal and that lake vessels could make the longer distance in as short or shorter time, still the fact remains that these vessels would travel on the round trip from 800 to 900 miles farther than necessary, and would in so doing use just that much more coal than needed. Vessels carrying grain from Chicago to New York must stop at the toll-gate at Buffalo. Here their cargoes must be unloaded and loaded again into barges or into cars. If lake vessels only are to be used in carrying freight from Chicago to Buffalo, then barges from western waterways must go through the same process of unloading and loading again at Chicago.

*The canal would probably enter Erie at Toledo, and Michigan at some river near the state line.

Only For Barges.

I do not wonder that Mr. Shepherd is a bear on inland waterways if he conceives that they must be used for ships. If the country goes to inland waterways, and it will, these waterways will all be for barges. It would be utterly impracticable to furnish bridges for cross-country travel that would let ships with their great smoke stacks and great hulks pass through. The Erie canal will always be a barge canal for this reason, no matter how deep and how wide it may be made. No matter how much Mr. Shepherd may deprecate it, the Mississippi and Missouri rivers will be canalized and not only the rivers themselves, but their tributaries likewise. The people of the middle west have been damned by the long railroad haul for all the years past and they are determined to have cheaper transportation both in and out. The country has suffered too much in the past to remain longer quiescent. The recent arbitrary raising of rates by the railroads and changing of schedules have set the people's teeth on edge again and their wrath is renewed.

The railroads have done what they could in the past and they will in the future, to destroy water navigation. They own nearly all the dockage in Buffalo and Chicago and practically dictate what freight shall go by water and what by rail. What they have done in these places they are fast doing in every other water port in the country. They have made the rates so low where there was water competition on the navigable rivers, that they killed the water traffic there. This is noticeably so along the Mississippi and Columbia rivers. When once they have stifled water navigation, back go the rates. Back they go, but always the railroad's rates are lower to river points than to inland points. Although there is very little navigation on the Mississippi, the freight rates to river cities are from $2 to $5 per ton less than to inland cities the same distance from the point of shipment. The same is true to cities on the Great Lakes. Chicago has a differential billing rate east to the Atlantic, 33-1/3 per cent lower than Indiana, Ohio and Michigan cities, hundreds of miles nearer the coast. The rate on wheat from Chicago to New York is 7½ cents per bushel by rail or water, while from cities in Indiana and Ohio the rate is 10½ cents per bushel. Freight that pays 11 cents per 100 at Chicago, pays 17 cents per 100 from Indiana points, not 50 miles distant from Chicago.

Water Only Competition.

I mention this to show the attitude of the railroads toward water navigation and also to show that the people the country over have no hope for competition except that furnished by water. Is there any reason then why the people are clamoring for inland waterways?

Should the traffic system of the country and the manufacturing of the country be both without competition, there would be no hope for the people, except what little they might get from their trust in God. The transportation business of the country is not wholly outside of competition except where there are waterways. With legal agreements and gentleman agreements, the railroads perform the trick and levy the taxes.

James J. Hill said a few days ago, in speaking about government suits against the railroads to restrain them from raising their rates on the western roads: "The tariffs which the western roads have in force are the same as charged by all other roads. They are uniform. Everybody knows that. I do not think there are any anti-trust laws that will prevent the roads from acting as they did. Surely not; laws do not touch them. We all know it. Their rates

are so uniform that they are oppressively monotonous."

Every year, hundreds of millions of water in the shape of stocks and bonds is injected into the already diluted railroad issues with no reason for the addition except to swell fortunes already too much swollen and to give occasion for the further raising of rates.

Either the country must go to inland waterways to furnish competition in transportation or the government must own the railroads or must devise some plan of control. Government ownership of railroads is unthinkable. Government control seems impossible.

Freight Savings.

The people would save every year in lowered freight rates the entire cost of building all the inland waterways in the country. This is true, though these waterways did no more shipping than is now done on the Mississippi river. Ninety per cent of all the trunk line railroads of the nation cross Indiana. Should the Michigan and Erie canal be constructed to a 14-ft. canal at a cost of $50,000,000 and should $25,000,000 be expended in the enlargement of the Miami and Erie canal, a saving in freight quadrupling these two sums would be saved every year. The trunk line railroads crossing Indiana carry 150,000,000 tons of heavy and bulky freight annually. A saving of $2 per ton on this would be $300,000,000. This would be the result if these waterways were no busier than are the other navigable rivers of the country. The saving to the people, however, brought about by these canals, will be much greater, because they will be very busy waterways.

It is objected that the railroads cannot stand this lowering of rates and this competition. No one should lose sleep on this account. Railroads will always do the passenger, the express, the mail and the merchandise business. Germany owns her own railroads, and yet she finds it profitable, not only to her railroads, but to her people as well, to canalize every stream and build canals wherever possible. In this country, where corporations own the railroads, it is necessary for the people to have some means of curbing their power. There is no way except through competition. Give the people highways free from corporate control and they need no longer fear the grip of the railroads at their throat.

There is no doubt about the temper of the people on this question. They are determined to have inland waterways, and they will get them. These waterways will form a net work all over this country. Every river and stream possible will be canalized and canals will be built wherever possible. This vast net work of inland waterways will all be for barges. When this time comes, trunk line barge canals leading to the sea will be needed.

There are but two trunk line inland barge waterways possible from the middle west to salt water within the borders of our own land; the one by the Mississippi river to the Gulf of Mexico; the other through the Mohawk Valley to the Atlantic. By the one it is 1,625 miles to the jetties in the Gulf of Mexico, and by it 3,500 miles by water from Chicago to New York; by the other it is only 1,000 miles from Chicago to New York. The ultimate markets of the middle west are east, not south, and so they will continue to be. Into this trunk line barge canal leading to the east, all the inland barge canals of the middle west will come with products from the west, the southwest and the great northwest, to float out to the sea. It will furnish the cheapest transportation that can possibly be had. Wheat will be carried by this trunk line barge canal from Chicago to New York for less than 1 cent a bushel. When the Erie canal is completed for large barges, the lowest possible cost for taking a bushel of wheat from Chicago to New York by the great lakes and the Erie canal will be twice that sum. The cost for a bushel fo wheat from Chicago to Buffalo by the lakes is 1¼ cent per bushel. To this must be added the toll at Buffalo for unloading and loading, and the transportation 520 miles through the Erie canal.

Promises Heavy Traffic.

In the future economy of transportation, no waterway will be of greater importance to the nation than will the Michigan and Erie canal. The great trunk line barge canal, leading from the middle west to the Atlantic, of which the Michigan and Erie will be an indispensable part, will be the busiest waterway in the world. There are 10,000 vessels of all kinds on the River Rhine, and it is today the busiest waterway in the world. When our inland waterways are made, the busiest waterway will be in this country.

Unless this canal is made, the transportation of our great lakes destined for export will go through the Canadian waters, not through ours. The Welland canal is to be enlarged and the Georgian Bay canal will be constructed. Our great lakes will be the feeders for these Canadian canals. If we would save our own commerce for ourselves, we must build inland waterways, but more especially must we construct the trunk line barge canals.

Our petty jealousies and the present seeming advantages of one locality over the other must give way to a broader view that takes in the whole people, those inland as well as those on the big waters. Those engaged in business that has to do with present transportation conditions should note the changes that are sure to come and unselfishly welcome the greatest good for all.

White Star Liners Olympic and Titanic

The work on the Olympic is now so well advanced that not only is it possible to appreciate the graceful lines of the hull, but also to observe in the development of the internal work of the vessel that interesting transition from the plans to the actual structure that is at once the delight and the reward of the constructor. All the hydraulic riveting is now completed, and various portions of the superstructure are in evidence. While the steel workers have yet much to do, they have made such progress that the woodworkers and others are to get ahead with their work in every direction, and the erection of the staterooms on the various decks is proceeding rapidly, as also is the fitters' and plumbers' work throughout the ship. The work on the Titanic is also proceeding very rapidly, and relative progress has been made with the construction of the machinery for both vessels.

A vessel with a rudder weighing 100 tons, beams 92 ft. long, and steel plates 36 ft. long, may be naturally expected to afford some interesting details with regard to the machinery, and it may be mentioned that each engine crank shaft weighs 118 tons; bed plate, 195 tons; each column, 21 tons; and the heaviest cylinder with liner, 50 tons; wing propeller, 38 tons—these being finished weights. The castings for the turbine cylinder weighed 163 tons, and for the propeller, which is of solid bronze, 22 tons.

Linnard Retires

Naval Constructor J. H. Linnard, for years senior officer in the bureau of construction and repair, United States navy, was placed on the retired list, Aug. 18, at his own request. He entered the naval service in 1877.

The following gem is from a London evening paper, of Aug. 12, in connection with the Terra Nova: "She was drawing a little water when she left Cardiff, but, as any sailor knows, a day or two at sea would swell her timbers and cure the leak."

Thermit Repair to Sternpost

One of the quickest thermit marine repairs in late years was the recent welding of a broken sternpost of the steamer Moses Taylor, of Cleveland. The steamer was placed in drydock at Cleveland on the afternoon of Friday, Aug. 19, and the weld was completed on Wednesday, Aug. 24, it being necessary to ship all materials from New York.

The fracture was caused by the steamer striking some obstruction in shoal water and breaking off the shoe close to the stern post, as shown in the engraving. The broken section was afterwards recovered by divers so that in executing the repair it was only necessary to line it up in its original position and make the weld.

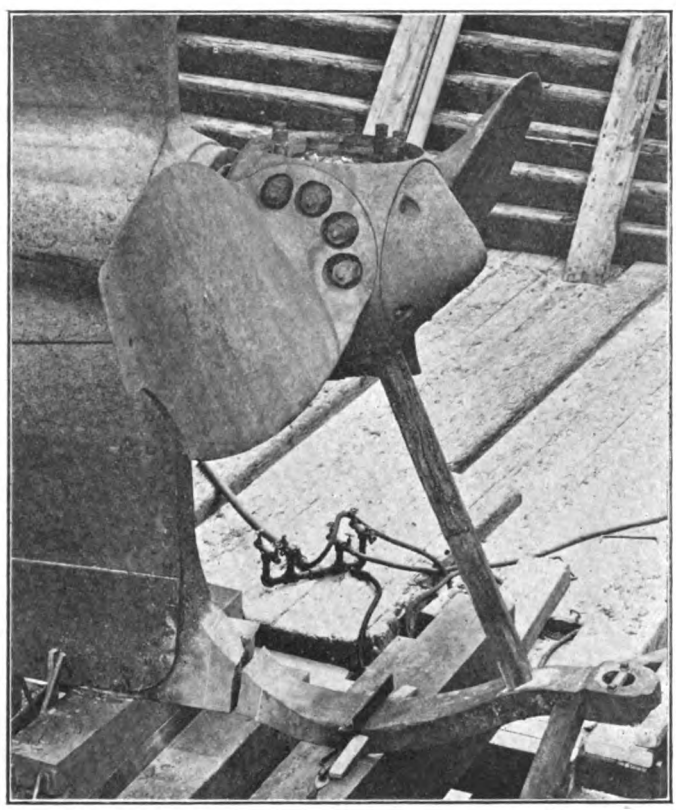
The size of the section at the fracture was 8½ x 12 in., and the weld was made in the usual way, building the mold around a wax matrix of the exact shape of the thermit steel collar or reinforcement which was to be provided.

After pumping out the dock on Friday, Aug. 19, the rudder was unshipped. On Saturday the broken shoe was lined up and other preliminary work attended to. No work was done on Sunday, and on Monday the wax matrix was applied and the mold box rammed up. On Tuesday the crucible was adjusted, the parts well preheated by means of a thermit preheater, and the weld was made at 1:30 p. m.

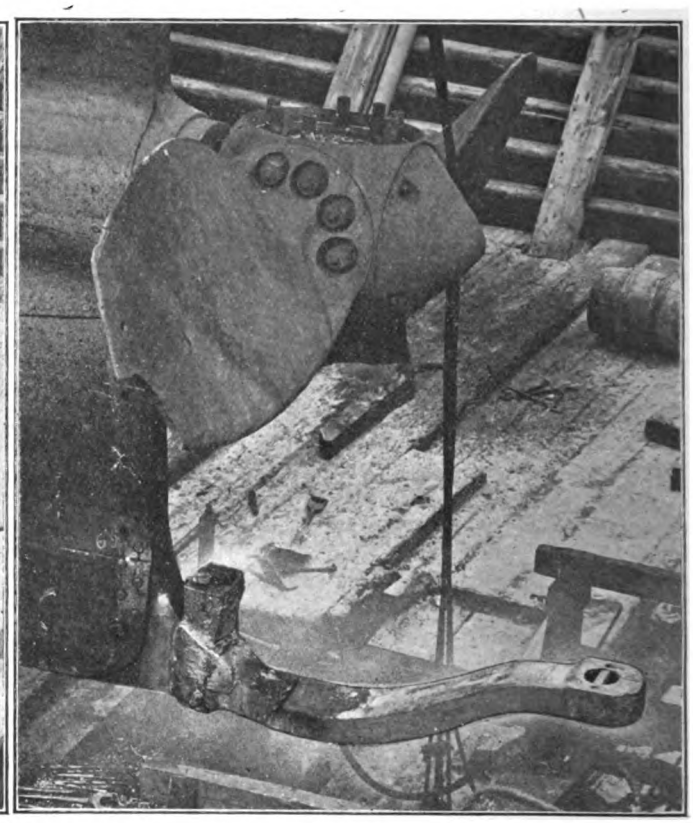
This operation required 600 lb. of thermit, 120 lb. of mild steel punchings and 12 lb. of crushed manganese.

The weld was allowed to stand over night and on Wednesday, while still quite hot, the mold was dismantled and the metal left in the gate and riser removed. Some of the metal at the bottom part of the collar was also removed so as not to increase the draught of the vessel at that point.

The work was executed under the direction of the Goldschmidt-Thermit Co., 90 West street, New York.



SHOWING BROKEN PART LINED UP, READY FOR WELDING.



VIEW OF FINISHED WELD, SHOWING METAL LEFT IN GATE AND RISER.

Steam Development

R. H. Thurston, of Cornell University, states in an article written by him for the Encyclopedia Americanna, that in the year 120 B. C., there was found at Alexandria a manuscript which proved to be a Hero's "Pneumatica," and, although the power of steam in connection with some sort of an engine has undoubtedly been known to mankind since the prehistoric period, this, however, is the first record of the steam engine and describes what is in all probability, the most simple steam turbine possible of construction.

There is, however, very little record of anything like a steam engine of today until 1705, when there was patented by Thomas Newcomen and his partner, John Calley, the first properly so-called steam engine. This consisted of a steam cylinder and piston actuating a beam above, from which was pendant the pump rod operating the pumps in the shaft of a mine; it was always used as a steam pumping engine, but was later improved by the addition of various valuable devices which gave James Watt his fame and fortune. This type engine became known later as the Cornish engine, and after Newcomen's death, was further improved in details by Desaguliers and by Smeaton. In 1718, the first automatic valve-motion was carefully designed by Henry Beighton. This, with Watt's invention of the separate condenser, the steam jacket, double-acting engines, the governor, etc., step by step, produced the engine that is the real basis of those we have in use at the present time.

From the small engines of the early part of the nineteenth century, to

those of the present time, is a change a little hard to appreciate, for it is estimated that the work of the world is performed by steam engines mainly, probably amounting to 150,000,000 H. P. and equivalent to the working power of several times the population of the globe, if employed in manual labor.

The wonderful growth of the steam engine is further evidenced by a letter recently received from the Penberthy Injector Co., of Detroit, stating that on March 29, 1910, Injector No. 600,000 was stamped and recorded ready for delivery. When one stops to consider that the above company, the largest manufacturers of injectors, in the world, has since 1887 made 600,000 of their automatic injectors, one obtains some idea of the large horsepower of the boilers which must be in operation at the present time, for it has been carefully estimated that 600,000 (size 2½-in.) GG Penberthy injectors would force into a boiler against 90 to 100 lbs. pressure over 1-3 of the amount of water that is constantly going over Niagara Falls, which is approximately 125,000,000 to 150,000,000 gallons per minute. This when transformed to steam at 70 lb. pressure is sufficient to develop power amounting to approximately 700,748,661 horsepower, or very near five times the estimated horsepower of the world's steam machinery.

Should the growth of steam power increase in the next hundred years as it has in the past, we will have as a result a combined horsepower capable of performing work the magnitude of which would be so great as to be almost inconceivable to the average person of today. The likelihood of the development in steam power during the next century, however, is not so much in a larger number of engines and boilers, although this is, through the natural growth of the universe, inevitable to a certain extent, but rather in an increased efficiency in those power plants which are to replace those that, because of age and wear, are constantly being discarded.

Motor-Driven Warships

The report that the British admiralty has decided to try the experiment of a motor-driven battleship, with internal combustion engines, though not officially confirmed, has naturally aroused the keenest interest in naval and engineering circles. The admiralty is maintaining a strict reserve as to the developments contemplated, but in the best of informed circles the belief is that the first step will be to equip a torpedo boat destroyer, and at a later date one of the smaller class of cruisers. Though some doubts are held as to the accuracy of the report relating to a motor-driven battleship, there is every reason to believe that the remarkable advance made in the efficiency of motor engines has engaged the serious attention of the admiralty, and the fact that the Hamburg-American Line has ordered a 9,000-ton steamer for their Atlantic trade, has, naturally enough, stimulated interest in this method of propulsion for large vessels. It is clear that even if the admiralty have not gone to the length of actually deciding to lay down a battleship on these lines, a development of this nature is absolutely certain in the near future.

One of the foremost marine motor engineers in Britain has stated that, though he was unaware of what were the real intentions of the British admiralty in regard to their reported intention to build a marine motor battleship, fitted with internal combustion engines, he had heard from a good source that an internal combustion engine of 10,000 H. P. had been ordered by the admiralty. The difficulty of constructing a satisfactory engine of such power, he pointed out, was extremely great. To drive a battleship of the Dreadnaught type, he added, engines of not less than 30,000 H. P. would be necessary, but should these be successfully produced, their installment on a warship in the place of the existing machinery would undoubtedly effect a valuable saving in weight and space. It was, however, unlikely that the British admiralty would put gas engines into a battleship or big cruiser until this type of engine had been brought to much greater perfection than at present.

A naval correspondent of the London *Standard* also says:

"The following facts, which I have every reason to believe are substantially correct, have come to my knowledge. I believe they furnish the real explanation of the rumor current at Portsmouth that a motor-driven battleship is to be constructed. A set of gas engines of 20,000 H. P. has been built in Lancashire. They are to be run experimentally for about a year. After they have run some three months, and provided that the running promises success, a second set of engines is to be constructed. One of the new 'Town' class of cruisers has been alternately designed to receive gas engines instead of a steam installation. Should the experimental gas engine running proceed satisfactorily, then the new set will be fitted in the cruiser. In such case she would be running in about eighteen months from now."

Additional evidence that the admiralty have something big up their sleeve is the fact that the successor to H. M. S. Orion on the building slip will not be commenced until the new year. This delay is so unusual as to have caused much comment for a long time, and the government has been greatly blamed locally. But if the warship to be next built at Portsmouth is to be the subject of an epoch-making departure then the delay explains itself quite naturally. It is noteworthy, too, that at all our great naval ports huge and well-protected oil tanks have been completed to store tens of thousands of tons of oil fuel, and mooring jetties erected alongside at which warships may lie and receive their supplies through a flexible hose.

Further, the admiralty has ascertained that naval oil fuel supplied need not come from foreign countries, which would be very unsatisfactory in time of war, for, in addition to the Scotch shale-oil distilleries, big oil-producing areas are being developed in British Guiana.

The important point is that nowhere in Portsmouth naval circles is the report of a motor-driven battleship, to be built at an early date, discredited, and, seeing how secret are all the doings of the admiralty nowadays, since the introduction of the Dreadnought regime, it is assumed that the statement made is in substance correct.

Experimental Tank for Ship Builders

The Ship Building and Engineering Employers' Federation, the wealthiest combination in Great Britain, is putting forward a scheme to aid ship builders and engineers engaged in the construction of warships and high-speed passenger mercantile vessels. The federation proposes to establish in London an experimental tank which would be valuable for all ship builders to carry out experiments with a view to securing greater stability and increased speed. A highly-skilled staff will also be provided. The scheme, if accepted, as it is likely to be, by the members of the federation, will be invaluable to the ship building interests of Great Britain.

Owing to serious illness, the family of Henry Fiesler, a lake engineer, residing at Mt. Pleasant, O., are desirous of communicating with him as soon as possible.

Book Reviews

Christian Unity in Effort.—By Frank J. Firth. 273 pages. J. P. Lippincott Co., Philadelphia, Pa.

F. J. Firth, the author of this book, as president of the Erie & Western railroad, operating the Anchor Line fleet of steamers on the lakes, was a very well known figure on the lakes until his retirement a few years ago. He is one of the past presidents of the Lake Carriers' Association. That he should produce such a book as this in his reflective moods is not surprising to those that know him. The book records some personal thoughts and beliefs and represents a conviction that every man and woman should acquire by individual effort such personal faith as is essential to a well rounded life.

The purpose of the book is to help the sincere seeker after truth to rise to a purer life of intelligent faith. He epitomizes the law of religious development in the old teaching as summarized by Solomon, based upon fear: "Fear God and keep his commandments, for this is the whole duty of man;" and the new teaching as founded in the new testament and illustrated in the parable which Christ related in answer to the question "Who is my neighbor," asking at its close. "Which now of these three, thinkest thou, was neighbor unto him that fell among the thieves?" And the lawyer answered: "He that showed mercy on him." Then said Jesus unto him: "Go and do thou likewise."

The law of development in things spiritual is again exemplified in the sermon on the mount. The rule of fear had been replaced by the rule of love. The book presents a thorough study of both the old and new testaments and the development of the creeds.

The concluding chapters are devoted to the great religious bodies and their numerous divisions. It is estimated that Christians number 400,000,000; Buddhists, 400,000,000; Mohammedans, 250,000,000; Brahmans, 150,000,000 and probably 300,000,000 Pagan or heathens.

Mr. Firth briefly traces the history of these four great religious beliefs. Mr. Firth also devoted some attention to Unitarianism, with which faith he apparently is personally in great sympathy.

His closing chapters are devoted to the history of the church in the United States. He puts the Protestant population of the United States at 65,600,000 and the Catholic at 14,600,000. He then defines the different theories of religious life as followed by the denominations. Briefly it may be stated that the Protestant basis of membership is belief and conduct; the Catholic, belief and obedience. Protestantism represent democratic theory of government, while Roman Catholicism represents autocratic theories. Mr. Firth briefly relates the history of the various denominations such as the Methodists, Baptists, Lutherans, Presbyterians, Desciples of Christ, Episcopalians and Roman Catholics.

The Catholic church, of course, occupies a unique position in this country. It is the only Christian denomination representing autocratic theory of religious life; it is the only denomination not distinctly identified with this country in its early history and theory of government; it is the only religious organization in this country having its controlling central government in a foreign land.

The closing chapter offers a few reflections upon the life hereafter.

New Fabre Line Steamer

The Fabre Line new twin screw steamship Sant Anna arrived at New York, Wednesday, Aug. 17, from Mediterranean ports. She was built at the shipyards of Le Forges et Chantiers de la Mediterranean, at Toulon, France. The steamer is 500 ft. long and 57 ft. wide, 14,000 tons, 10,000-horsepower. Her speed is about 18 knots. She accommodates eighty first cabin passengers in rooms for one or two only, with private bath and toilet.

Besides the comforts and conveniences installed for the benefit of first-class passengers, the steamer is equipped with refrigerating plants, electric light, Marconi wireless, watertight compartments, steam heat, electric ventilation, laundry, etc. The first-class accommodations are situated on three decks and all rooms are outside, occupying a position amidships. Cabin accommodations are entirely isolated from all portions of the steamer, and all details are so perfectly worked out that this section comprises in itself a floating hotel of sumptuous luxury. The two promenade decks are of magnificent proportions and completely encircle the superstructure and the forward portion is enclosed completely in glass, forming a veranda entirely protected in rough weather. The upper promenade deck is shaded by awnings and is particularly attractive for outdoor dining. On this deck is situated the Parisian Outdoor Terrace Cafe, smoking room and the wireless station. Telephones have been placed in each stateroom. The dining saloon occupies the forward portion of the upper deck and is divided into three sections by transversal arches. Tables are provided for from two to ten persons each, with or without a service a la carte. The chapel on board is available for religious services of all creeds and includes all necessities for the holding of Catholic services. There is on board an American bar, barber shop, baths and lavatories, servants' cabins and a dark room for passengers who may wish to personally direct the development of the result of their cameras.

The officials of the company state that the line has had nearly 30 years of success as Mediterranean carriers; and in addition to this new steamer, it has ordered another one, the keel of which will be laid in a few weeks and which will be called the Canada. The enormous size of the Sant Anna and of the Canada has made it necessary for the Fabre Line to seek new docking facilities, and it has built a new pier foot of Thirty-first street, South Brooklyn, one of the largest steamship piers in the world. It is 1,476 ft. long and 150 ft. wide, and the slips are 275 ft. wide and 35 ft. deep. The new pier is almost as long as eight city blocks. Railway tracks are to be laid the entire length of the pier.

Monel Metal Propellers

The four propellers for the battleship Florida, recently launched at Brooklyn, and which are to be cast in Monel metal by the Bayonne Casting Co., Bayonne, N. J., will be 10 ft. 6 in. diameter and will weigh approximately 8,000 lbs. each. The same company has a contract for 12 propellers for the two new Argentine battleships, which are under construction by the Fore River Shipbuilding Co., Quincy, Mass., and the New York Shipbuilding Co., Camden, N. J. These propellers will be 15 ft. 6 in. diameter and will weigh approximately 16,000 lbs. each, and are said to be the largest ever made of this alloy. The contract for these 12 propellers is also said to be the largest for Monel castings ever placed. The trend of propeller practice with turbine-driven ships is evident from the fact that all these propellers are of the solid type, which makes a complete spare propeller necessary in case of damage, as will be noted from the fact that the Argentine ships have a complete set of spares.

Some recent investigations carried on in the engineering laboratories of the University of Wisconsin with alloys of Monel metals and electrolytic iron, reported in *The Iron Trade Review*, indicate that remarkable results are to be looked for in the future from such mixtures, as, in addition to the high tensile strength and elastic limit, the mixture possesses high corrosion-resisting qualities.

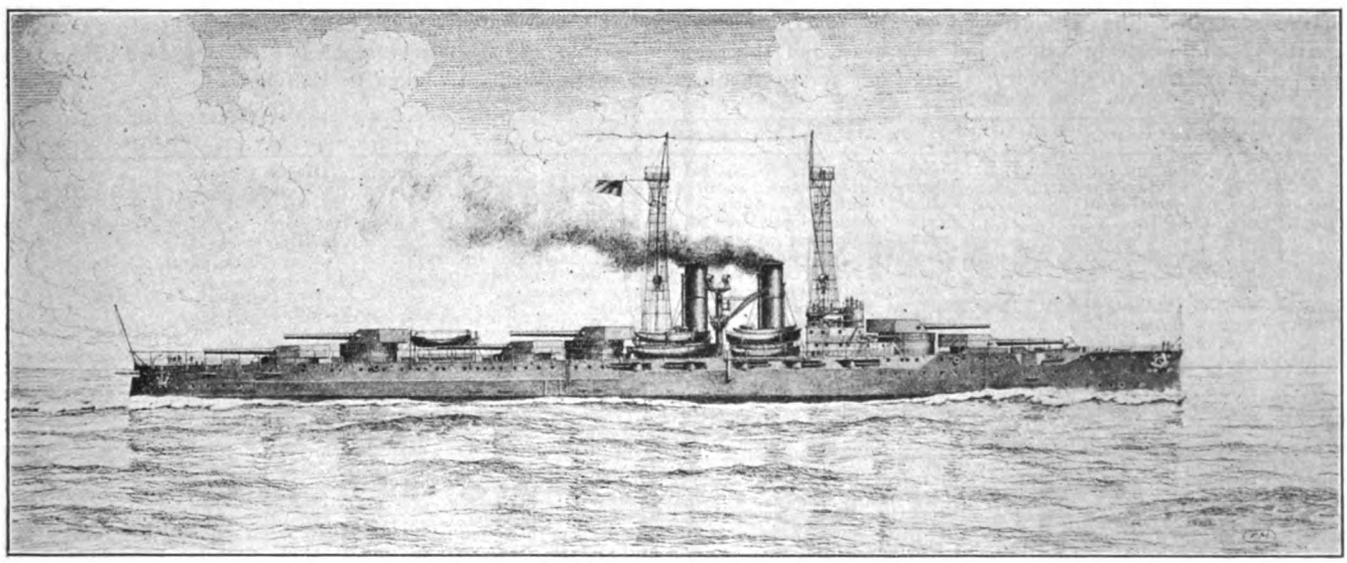
A municipal dry dock, 1,000 ft. long, which can accommodate the largest vessels, has been proposed for New York by the dock commissioner, Calvin Tompkins.

Battleships Wyoming and Arkansas

The plans and specifications for the first-class battleships, Wyoming and Arkansas, authorized by act of congress, approved, March 3, 1909, were completed and circular signed by the secretary of the navy, June 14, 1909, and issued to the bidders upon request thereafter.

The general dimensions and features of each vessel are as follows:

Length on load water line, 554 ft.
Breadth, extreme, at load water line, 93 ft. 2⅝ in.
Mean trial displacement, 26,000 tons.
Mean draught to bottom of keel at trial displacement (about), 28 ft. 6 in.
Total coal bunker capacity (about), 2,500 tons.
Coal and fuel oil carried on trial, 1,933 tons.
Feed water carried on trial, 187 tons.
Speed on trial, not less than 20½ knots.



DRAWING OF THE BATTLESHIPS WYOMING AND ARKANSAS AS PREPARED BY THE NAVY DEPARTMENT.

Armament:—
Main battery: Twelve 12-in. 0.50-caliber breech loading rifles; two submerged torpedo tubes.
Secondary battery: Twenty-one 5-in. rapid-fire guns; four 3-lb. saluting guns; two 1-lb. semi-automatic guns for boats; two 3-in. field pieces; two machine guns, caliber 0.30.

Bids for the construction of the above vessels were opened at the department, Aug. 18, 1909, and the contracts awarded on Sept. 13, 1909, the Wyoming to the Wm. Cramp & Sons Ship & Engine Building Co., of Philadelphia, Pa., at a price of $4,450,000, and the Arkansas to the New York Ship Building Co., of Camden, N. J., at a price of $4,675,000, both to have the department's design of machinery installed.

The vessels are to be completed on or before the expiration of 32 months from the date of signing the contract. The contract for the Wyoming was signed, Oct. 14, 1909, and for the Arkansas, Sept. 25, 1909.

The percentage of degree of completion of the hull on Aug. 1, 1910, was 32.3 per cent for the Wyoming and 39.5 per cent for the Arkansas.

Cold Storage Barge

Cammell, Laird & Co. have just completed for the Sociedad Anonima, La Blanca, Buenos Aires, a novel cold storage barge for carrying chilled meat from their La Blanca works. The dimensions of the new barge are:

Length between perpendiculars, 207 ft.; breadth moulded, 36 ft., and depth moulded, 22 ft. She is built to Lloyd's scantlings, and has two complete steel decks, and is divided by bulkheads into two large holds. These holds are fully insulated and equipped with the latest arrangement of runner rails and meat hooks for carrying the carcases, and have a special loading chamber on the center extending to the bottom of the ship and fitted with large and insulated doors to each hold. The capacity of the insulated spaces is 80,000 cu. ft.

The vessel has five watertight bulkheads and a large fore peak tank for trimming purposes, filled and emptied from the engine room. The deck equipment is very complete, comprising steam windlass, two steam winches, steam capstan aft and steering gear on captain's house; two steel derrick posts are fitted for working three derricks, and capable of lifting two tons, for loading and discharging purposes. Each hold has two large insulated hatchways, and besides the usual covers, steel rolling covers on rails are provided for covering the hatchways in the event of a sudden storm. The vessel is lighted throughout with electric installation, and has large cargo clusters on deck for loading and discharging at night.

The four meat holds, which are of approximately equal capacity, are heavily insulated with selected granulated cork with linings of p. t. and g. boards, with an interlining of waterproof insulating paper. Heavy insulated hatch covers are fitted to each of the hatches and insulated doors are fitted in the midship hatch to form the entrance to the chambers from the same. Each chamber is separately insulated so that any temperature can be maintained in any one space as required. The refrigerating machinery is throughout of the duplex type, and includes horizontal compound duplex ammonia machine of the marine type, and having high and low-pressure cylinders arranged side by side, driving from the tail rods to horizontal double-acting ammonia compressors.

The brine distribution is on the Webb and others patent attemperated system, and the arrangements are such that brine of higher or lower temperature can be supplied to any of the chambers independently, so that the temperatures can be absolutely and positively controlled exactly as required. For the quick loading and discharging of the vessel, each chamber is fitted with a complete outfit of rails, supported from the deck beams, for runner meat hooks. Each rail is controlled by a patent switch, so that any quarter loaded in from the main hatch can be run on any rail or into any part of the chamber. In way of the twin hatches at the forward and after ends of the vessel an adaptation of Webb and others patent portable hatch rails has been fitted. The rails in wake of each of these hatches are so arranged that they can be lifted out or lifted in with the meat on them, which arrangement greatly facilitates both loading and unloading. This barge marks a great advance in anything previously built for the transportation of meat under refrigerated conditions, both as regards the exact and complete control of temperature and the facilities for loading and discharging.

ACCIDENTS TO LAKE VESSELS

THE most serious accident to the lake fleet during August was the grounding of the steamer Thomas F. Cole, flagship of the Pittsburg Steamship Co.'s fleet, about 6 miles off Detour, during a heavy smoke on Aug. 24. General regret is expressed in lake circles over Capt. Morgan's misfortune, but accidents will happen to the best of men.

The Cole was bound up light and she went on hard for over half her length, puncturing a number of her starboard tanks. She was exposed to southerly and westerly winds, and as the weather was fresh every effort was made to expedite her release. The wrecker Favorite was rushed to her assistance and released her within a few hours after reaching her, much to the company's surprise and relief, as it looked like a long job. The Cole returned to Lake Erie and was docked at Lorain. Examination of her bottom revealed the fact that she had 92 damaged frames and that 45 plates would have to be taken off.

The barge J. H. Pellett, belonging to the Kelley Island Lime & Transport Co., was in collision with the car ferry, Marquette & Bessemer No. 15, between Ashtabula and Conneaut, on Aug. 10. Her bow was crushed in practically to the collision bulkhead and the wonder is that she did not go to the bottom. Capt William Kelley, master of the Pellett, was knocked into the hold by the force of the collision and was pretty badly shaken up. The Pellett was in tow of the tug W. B. Sanders at the time. The Sanders towed her to Cleveland, where she was put in dry dock.

The steamer Moses Taylor ran aground in a fog near Sarnia and broke her shoe. A description of the repairs to the shoe by the thermit process will be found elsewhere in this issue.

The steamer Schoolcraft was sunk in collision with the steamer Amazon in the St. Clair river. Her stem was pretty badly twisted, but after temporary repairs were effected she was taken to Buffalo.

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	LOCATION.
Aug. 4	Str. Avon	Collided with Str. S. N. Parent	Welland canal.
Aug. 4	Tug Joe Harris	Hit by Str. Starucca; repaired at Cleveland	Cuyahoga river.
Aug. 4	Str. S. N. Parent	Collided with Str. Avon	
Aug. 5	Str. Canadiana	Fender strake ripped off 25 ft. while trying to make landing in gale; all fenders on starboard side carried away	Crystal Beach, Lake Erie. Welland canal.
Aug. 7	Str. Huronic	Machinery disabled; stopped one day at Sault for repairs	Near Sault canal.
Aug. 8	Bge. Montana	Sprang a leak; crew taken off and tow line cut from Str. Fairmount; latter picked up by passing steamer	Port Clinton, Lake Erie.
Aug. 9	Str. C. Tower	Sank at her moorings, blocking passage	Milwaukee.
Aug. 9	Tug Welcome	Broke down; towed to port by Tug Dunkirk	Lake Erie, off Cleveland.
Aug. 10	Bge. J. H. Pellett	Collided with car ferry M. & B. No. 15; bow crushed in almost back to collision bulkhead; docked at Cleveland; M. & B. 15 not damaged	Between Ashtabula and Conneaut, Lake Erie.
Aug. 12	Str. Moses Taylor	Ran aground in fog; released herself; shoe broken off close up to stern-post and two buckets lost off wheel; towed to Cleveland and docked on Aug. 17; shoe welded by Thermit process; new rudder put on	Near Sarnia, St. Clair river.
Aug. 15	Str. E. B. Osler	Stranded; released on Aug. 17 after lightering 1,000 tons of coal; did not reload all of lightered cargo	Middle Ground, St. Clair river.
Aug. 15	Tug Booth	Broke her shaft while pulling on stranded Str. Osler	St. Clair river.
Aug. 17	Str. Panay	Stranded, but released herself; pumps kept her free and she proceeded	Above Canadian lock, Sault.
Aug. 18	Str. Amazon	Collided with Str. Schoolcraft; not damaged	Lake St. Clair.
Aug. 18	Str. Schoolcraft	Collided with Str. Amazon; bow badly damaged, sank in shallow water; stem twisted; temporarily patched up; repaired at Buffalo	Lake St. Clair.
Aug. 20	Str. Lakeside	Rail and cabin damaged while landing	Buffalo.
Aug. 20	Str. Hoover & Mason	Steering gear broke and she ran on bank; released herself	Bar Point, Detroit river.
———	Str. Neebing	Grounded; broke couple of buckets off wheel	Georgian Bay.
Aug. 22	Str. Emma C. Tyson	Capsized owing to swells from passing steamer; 215 tons of coal, as well as boiler, dumped into river	Detroit river.
Aug. 22	Str. Ogdensburg	Ran aground when steering gear became disabled	Elliott's Point, Detroit river.
Aug. 22	Str. Reynolds	Wheel chains parted; by dropping both anchors saved herself from hitting rocks	Head of Livingstone channel, Detroit river.
Aug. 24	Str. Thomas F. Cole	Stranded in heavy smoke; released on Aug. 25 and taken to Detour; all tanks on starboard side leaked; docked at Lorain, Aug. 30; 92 frames damaged and 45 plates taken off	Near Detour, Soo river.
Aug. 24	Str. Homer Warren	Grounded at turning point; released herself, uninjured	Mud Lake.
Aug. 25	Str. Bennington	Hatch covers and woodwork damaged by fire while lying alongside burning elevator	Ogdensburg, N. Y.
Aug. 25	Str. C. C. Hand	Ran aground; released by Tug H. D. Goulder	Grassy Island, Detroit river.
Aug. 25	Str. Sahara	Ran aground; released on Aug. 27; reloaded lightered cargo	St. Clair river.
Aug. 26	Schr. Alice B. Norris	Dismasted in storm	Near Whitehall, Lake Michigan.
Aug. 26	Str. Powell Stackhouse	Struck by car ferry Grand Haven; number of plates damaged	Milwaukee, Wis.
Aug. 28	Str. Bulgaria	Stopped for repairs to broken crosshead	Canadian Sault.
Aug. 29	Str. Flagg	Ran aground; released by Tug Goulder	Near Huron, Lake Erie.
Aug. 30	Str. Castalia	Struck an obstruction, puncturing compartment No. 1; stopped at Port Huron, where air compressors were put aboard and she left for Cleveland, where she was docked	Near Corsica Shoal Lightship.
Aug. 31	Str. Lakeland	Grounded on a reef; released Sept. 1, uninjured	Thunder Bay river.
Sept. 1	Str. W. K. Bixby	Collided with Str. F. B. Wells; starboard anchor smashed, hawse pipe broken and number of plates dented; repaired before she sailed; Str. Wells not injured	Ashtabula.
Sept. 4	Str. Italia	Ran aground	Raber's Point, Mud lake.

The Western Dry Docks Co., Port Arthur, has placed orders for one large plate shear, one bending roll, one angle shear, one lathe and one drill, with the John Bertram & Sons Co., Dundas, Ont.; for electrical equipment with the Canadian Westinghouse Co., Hamilton, Ont., and for pumping machinery with the John Inglis Co., Toronto.

Roy M. Wolvin has organized the Duluth Shipping Co., with H. H. Dunham in charge of the Duluth office and Roy A. Williams in charge of the Cleveland office.

Arthur H. Vogel, of Milwaukee, was the lowest bidder for excavation work in the channel in Niagara river, below the Black Rock ship canal lock. His bid was $532,100.

Commerce of Lake Superior

The commerce of Lake Superior, as measured by the Sault Ste. Marie canals, reached the respectable figure of 9,744,556 net tons during August, being 230,617 tons less than the movement during July, when 9,975,173 tons were moved. The movement to Sept. 1 totals 40,046,800 tons, as against 29,812,256 tons during the corresponding period last year. The figures for the coal movement rather belie the apparent lassitude in that trade and again prove the fact that the lakes handle enormous units so easily as to be really deceptive. The summary is as follows:

	To Sept. 1, 1909.	To Sept. 1, 1910.
EAST BOUND.		
Copper, net tons	65,499	77,070
Grain, other than wheat, bushels	13,831,382	22,068,070
Building stone, net tons.	1,125	6,990
Flour, barrels	2,969,368	3,791,428
Iron ore, net tons	21,320,149	28,055,531
Pig iron, net tons	17,549	19,331
Lumber, M. ft., B. M.	315,129	374,379
Wheat, bushels	24,497,194	32,695,234
Unclassified freight, net tons	89,654	87,357
Passengers, number	22,755	23,594
WEST BOUND.		
Coal, anthracite, net tons.	798,545	1,060,259
Coal, bituminous, net tons.	4,802,158	7,297,788
Flour, barrels	1,805	1,100
Grain, bushels	1,000	2,100
Manufactured iron, net tons	272,979	247,327
Iron ore, net tons	8,213	.....
Salt, barrels	444,404	397,367
Unclassified freight, net tons	522,188	724,787
Passengers, number	24,652	27,567
SUMMARY OF TOTAL MOVEMENT.		
East bound, net tons	23,341,909	30,657,557
West bound, net tons	6,470,347	9,389,243
Total	29,812,256	40,046,800

The total number of passages to Sept. 1, 1910, was 13,118, and the net registered tonnage, 32,540,548.

A New Water-Tube Boiler

The accompanying illustration shows a new type of straight tube boiler for marine and stationary use, built by the Charles Ward Engineering Works, Charleston, W. Va.

The boiler shown is one of the smaller sizes and has 470 sq. ft. of heating surface and 19 sq. ft. of grate, and weighs, complete, 5,730 lb., built for a working pressure of 200 lb. steam.

The front and back headers for receiving the tubes are steel castings of rather novel design. The walls or plates are ½ in. thick, with a water space between. The two walls are connected to each other by vertical webs between each alternate vertical row of tubes, thus forming rectangular water passages. The webs stop a few inches from the top and bottom of the header, giving a passage connecting each vertical row and affording perfect circulation.

The back header has a flanged connection to the bottom of the drum, which gives the down-flow passage and completes the circulation, which, due to the incline of the tubes, is free and unobstructed, each vertical row having its individual return tube to the drum.

The boiler shown has 148 generating tubes, 2 in. diameter, and 18 return tubes, 1⅝ in. diameter. All tubes are expanded into the headers and drum,

WARD'S NEW WATER-TUBE BOILER.

no screwed joints in or near the fire. Screwed plugs opposite each tube give free access for cleaning or removing the tubes. Any tube can be removed and replaced without disturbing any of the others.

The furnace door opening is water-lagged with ample passages to insure perfect circulation, eliminating all trouble with cast iron liners and fire brick.

The casing is substantially constructed of sheet steel and angles, lined with ½-in. asbestos, the front and back are easily removed for access to the tubes.

The floor space required is 4 ft. 3 in. by 6 ft. 3 in., and the height in front is 5 ft. 2 in. The heating and grate surface may be varied by lengthening the tubes and grates, each additional foot of length increasing the heating surface about 80 sq. ft.

These boilers are built in standard sizes, but dimensions may be varied to suit requirements. The larger sizes are constructed entirely of open-hearth steel plates, the headers riveted together and stayed by an improved method, which insures freedom from troublesome screwed and riveted stay-bolts, there being no openings through the plates except the tube holes. In these sizes, the openings in front of the tubes are closed by small hand-hole plates—no screwed plugs.

The builders now have under construction a boiler of this type, 9 ft. wide, with 432 tubes, 2 in. diameter and 36 tubes 3½ in. diameter, giving about 2,000 sq. ft. of heating surface, the steam drum being 40 in. outside diameter and located on front header, which is the low end of the boiler.

Obituary

Thomas F. Griffin, formerly connected with the firm of Corrigan, McKinney & Co., of Cleveland, and known from one end of the lakes to the other through his wide knowledge of the ore trade, died at Colorado Springs, on Monday, Aug. 29. It became apparent about eight years ago that he was afflicted with tuberculosis. The firm thought so much of him that Mr. Corrigan sent him to Mexico in his private car, where he remained the greater part of a year. He later returned to Cleveland, but it was soon apparent that the climate of the lower lake region was too rigorous for him. He removed with his family to Colorado Springs seven years ago. He leaves a widow. Mr. Griffin was about forty-two years old.

Capt. John Green, one of the notable men on the great lakes, died at Buffalo, on Saturday, Aug. 27. Capt. Green was born near Dublin, Ireland, on Dec. 27, 1832. When eight years old his parents emigrated to Toronto, where his father died two years later. He began sailing at the age of ten. He secured a first mate's certificate within a few years. Later, seeing the possibilities in harbor towing, he went into that branch of the business and became the owner of a number of tugs. He was a blunt, straightforward man and was much respected.

Pere Marquette No. 18 Founders

Carferry Pere Marquette No. 18, owned by the Pere Marquette Railroad Co., and operating between Ludington and Milwaukee, sank off Sheboygan, on Sept. 9, drowning 28 members of her crew. The cause of the disaster is not as yet known. The carferry left Ludington at 11:30 p. m., with 29 loaded cars. There was a fresh wind blowing, but the carferry was apparently making good weather of it until 4:30 a. m., when she was observed to be taking water rapidly aft. She was headed with all speed for the Wisconsin shore, working her pumps meanwhile and flashing wireless messages for help. Several cars were run overboard to lighten her, but at 7:30 o'clock she suddenly sank. Meanwhile Pere Marquette No. 17 responded to the distress signals and arrived on the scene just as No. 18 went down. Lifeboats were lowered and about thirty members of the crew were picked up. Pere Marquette No. 18 was built at the Cleveland yard of the American Ship Building Co., in 1902.

Welin Davit and Lane & De Groot Co.

The Welin Davit and Lane & De Groot Co. are removing their main office from New York to Long Island City, though for the time being the office at 17 Battery Place will be retained. The company reports an unusually successful season. In the boat and launch department its sales have increased about 50 per cent over last year's sales. The company sold during the spring of 1910 some 10,000 A B C life preservers, manufactured and delivered 180 life boats, 20 rafts and 18 steel and wooden launches. It has just completed and delivered a 28-ft. launch to the Coast & Geodetic Survey and six power boats to the Light House service.

The new Goodrich liner Alabama, which went into commission on the great lakes during the latter part of June, is entirely equipped with the company's life saving apparatus, including boats, davits and life preservers. These davits are fitted with a new lowering drum arrangement which is an innovation in gear of its kind and the Alabama is the first to carry it.

The Olympic and Titanic, the two White Star liners now building, will be entirely equipped with Welin davits of the double quadrant type which permit of carrying two boats under one set of davits. On the basis of this design the British Board of Trade has made a new ruling, permitting the carrying of one boat inboard provided it is stowed directly alongside a boat which is placed under davits.

Orders booked for Welin quadrant davits in recent months include the following:

Steamers—Ancon, Isthmian Canal Commission; Christobal, Isthmian Canal Commission; J. A. Chanslor, Associated Oil Co.; Bear, San Francisco & Portland Steamship Co.; Beaver, San Francisco & Portland Steamship Co.; Daniel Willard, Erie Railroad Co.; Gen. Geo. H. Weeks, United States Government; Gen. S. B. Holabird, United States Government; Gen. D. S. Stanley, United States Government; Alabama, Goodrich Transit Co.; Aloha, Curtis James; Fulton, D., L. & W. R. R.; Honoluluan, American-Hawaiian Steamship Co.; Seminole, Southern Pacific Co.; Navajo, Southern Pacific Co.; Ensinal, Southern Pacific Co.; Melrose, Southern Pacific Co.; Rikers Island, New York City; new ferry, Newburgh Ferry Co.; new steamship, building at Dubuque, Ia.; hull 108 (building at New York Ship Building Co.'s Works), Merchants and Miners Transportation Co.; hull 109 (building at New York Ship Building Co.'s Works), Merchants and Miners Transportation Co.

SUMMARY OF NAVAL CONSTRUCTION.

Name of Vessel.	Speed, Knots.	—Building at—	—1910— Per cent of completion July 1.	Aug. 1.
BATTLESHIPS.				
Florida	20¾	Navy Yard, New York	68.8	71.0
Utah	20¾	New York S. B. Co.	80.0	83.2
Wyoming	20½	Wm. Cramp & Sons	28.4	32.3
Arkansas	20½	New York S. B. Co.	34.6	39.5
TORPEDO BOAT DESTROYERS.				
Paulding	No. 22	Bath Iron Works	92.4	93.4
Drayton	No. 23	Bath Iron Works	86.1	88.1
Roe	No. 24	Newport News S. B. Co.	92.3	97.1
Terry	No. 25	Newport News S. B. Co.	89.7	91.5
Perkins	No. 26	Fore River S. B. Co.	86.8	92.3
Sterett	No. 27	Fore River S. B. Co.	83.8	88.4
McCall	No. 28	New York S. B. Co.	85.4	89.6
Burrows	No. 29	New York S. B. Co.	85.2	87.5
Warrington	No. 30	Wm. Cramp & Sons	74.4	79.5
Mayrant	No. 31	Wm. Cramp & Sons	79.1	80.8
Monaghan	No. 32	Newport News S. B. Co.	26.7	28.4
Trippe	No. 33	Bath Iron Works	49.9	56.7
Walke	No. 34	Fore River S. B. Co.	39.1	47.6
Ammen	No. 35	New York S. B. Co.	48.5	56.3
Patterson	No. 36	Wm. Cramp & Sons	33.0	40.7
SUBMARINE TORPEDO BOATS.				
Salmon	No. 19	Fore River S. B. Co.	97.4	97.8
Carp	No. 20	Union Iron Works	58.6	60.0
Barracuda	No. 21	Union Iron Works	58.6	60.0
Pickerel	No. 22	The Moran Co.	53.1	56.8
Skate	No. 23	The Moran Co.	53.1	56.8
Skipjack	No. 24	Fore River S. B. Co.	45.3	48.6
Sturgeon	No. 25	Fore River S. B. Co.	43.7	46.2
Thrasher	No. 26	Wm. Cramp & Sons	6.4	7.9
Tuna	No. 27	Newport News S. B. Co.	28.3	29.9
Seal	(Lake)	Newport News S. B. Co.	51.2	52.2
COLLIERS.				
Cyclops		Wm. Cramp & Sons	79.3	84.3
No. 8		Maryland Steel Co.	34.9	37.9

Seneca Chain Co.

The Seneca Chain Co. has just awarded contract for the construction of its new chain and forging plant, at Kent, to the Mt. Vernon Bridge Co., Mt. Vernon, O. These new buildings will cover approximately an area of three and one-half acres and will be constructed entirely of steel and iron on concrete foundations. A large quantity of new and modern power and operating equipment will be installed with a view of securing the most economical production with the greatest efficiency of operation. The capacity of this new plant is somewhat larger than that of the old plant, destroyed by fire on Dec. 10, 1909, and with the plant at Mansfield, will make it possible for this company to largely increase its output. It is expected that the new plant will be completed by November or December 1. Two new testing machines will be installed, making it possible to manufacture the largest size of chains in use today for any purpose, but especially in the line of anchor cables for large steamers and battleships.

A Curious Occupation

Probably no hill in the world, says the *London Graphic*, has had so strangely varied a history or played so important a part in the affairs of men as that at Greenwich. The granite line across the foot-path on its summit is the meridian from which the longitude on every British map and chart is calculated. All England sets its time by the mean solar-clock. There is a large galvano-magnetic clock fixed on the outside wall of the observatory and divided into 24 hours. There are still many who believe this clock is kept going by the sun. They do not know that the fixed stars are the real time-keepers from which Britishers check their daily progress. To this galvano-magnetic clock in the wall comes every Monday a woman, who makes $2,500 a year out of the queerest occupation in England. She sells the time to London watchmakers. Her name is Miss Belleville, of Maidenhead. Eighty years ago, the then astronomer royal suggested to her father that if he took the corrected time of a certified chronometer every week, he could no doubt find numerous clients. So he bought a famous watch made for the Duke of Essex, one of the sons of George III, and soon worked up a business with it. When he died, his widow sold the time till she reached the age of 81, and then she handed the business over to her daughter. When Miss Belleville visits Greenwich at the beginning of every week, her chronometer is corrected and she is given an official certificate. From that her fifty customers correct their watches and clocks.

The torpedo boat destroyer Drayton was launched from the ship yard of the Bath Iron Works, Bath, Me., on Aug. 22.

The Extinction of Our Merchant Marine

(From the *Scientific American.*)

We seem to be within measurable distance of the time when we shall have to substitute the word "extinction" for "decline" in speaking of our once famous merchant marine, which, in the earlier half of the last century, held a more commanding lead among the fleets of the world than is held today by the shipping of Great Britain. In view of the usually quick response of the American people to any appeal which touches their national pride, the general apathy with regard to the disappearance of our ships from the high seas is a problem for which it is impossible to find an adequate solution.

With a reiteration which would become tiresome were not the issues at stake so enormous, it has been proved to a demonstration that the economic conditions in the United States affecting the construction and operation of ocean-going steamships are such, that the only possible way to resuscitate our merchant marine and carry it along until it has attained a sufficiently lusty growth to hold its own in competition with the fleets of the world is for the government to step in and afford some measures of relief.

So frequently has the *Scientific American* laid before the public the unanswerable arguments in favor of government assistance that we hesitate to repeat them; but the facts recently given in the investigation before a special house committee by A. H. Bull, of New York, are so convincing that we feel constrained to repeat them in these columns.

Mr. Bull is the owner of two freight steamships of the same tonnage, one of which sails under the American flag and the other under the British flag. In order to make his comparison the more complete, the witness put in evidence data which he had gathered from the German naval records regarding the expenses of a similar steamship sailing under the German flag. The total wages of the crew on the American ship per month are $1,470; on the British ship, $897.04; and on the German ship, $483.82. The pay of the American captain is $175; of the British captain, $100, and of the German captain, $79.75 per month. The American chief engineer receives $150 per month, the British chief engineer, $97.20, and the German chief engineer, $79.75.

This difference in wages is surely a sufficient handicap in itself; but Mr. Bull states that the higher quality of the food and outfit called for by the United States government places the American owner at a further disadvantage, the increased expense in this direction being as great as the increased cost of wages. It should be added, however, that the German captain receives a certain percentage of the gross receipts from freight, which makes the compensation of the German and British captains approximately equal.

Returning to the comparison of the two identical ships owned by Mr. Bull and sailing, one under the American and the other under the British flag, the American ship is under the further handicap that the law requires her to ship seven more men than the British ship. Furthermore, she is never permitted to leave port without a full complement of officers and men, while the British ship may sail short-handed and pick up the balance of her crew at the different ports of call.

Surely the disabilities mentioned above are sufficient in themselves to prove how impossible it is for sea-going ships flying the American flag to compete successfully against the two great maritime nations, Great Britain and Germany, but it is a fact that before the costs of operation come into play, and at the very time that an American-built ship casts off her moorings for her first deep sea voyage, she is already laboring under a heavy handicap represented by the increased cost of construction. For even in our best equipped shipyards the high cost of labor so far offsets our cheap steel that the American-built ship costs more, ton for ton, than does one built in foreign yards. Nor is it at all to the point to quote the case of the Argentine battleships, the contracts for which were secured by American builders largely because they were able to underbid foreign ship yards. The firms which are building these two battleships are in a combine which includes one of the largest steel and armor manufacturing plants in this country, and the builders consequently did not have to figure on the heavy royalties on armor, and the usual profits on the structural and plate steel used in the construction of the hull.

An American traveler, happening to be in Singapore, and observing the total absence of the American flag from that busy haven, had the curiosity to investigate the records of the port and ascertain the true conditions. He found that out of over 20,000 vessels that had cleared during a given period from Singapore, only a single ship flew the American flag.

What are we going to do about it?—

Humor in Business

While the following is not an engineering item, it certainly is worthy of publication anywhere as a fine bit of humor. According to the *American Pressman,* a Cincinnati commission house had sold a bill of goods to a new customer in the interior of Kentucky, who was not rated in the commercial reports. The goods went C. O. D., and a typewritten letter advising the country merchant that the goods had been sent, was mailed to him. The merchant acknowledged the receipt of the letter and raised some highly original objections to the business methods of the commission house. He wrote as follows:

"Jentlemen—I want you to understand sur that I aim't no dam fool when I bort that Bill from that read Headed Agent of yores he tole me that you sent him all the way from cyncynita to git that order. I thot he was lying and i bort all my goods from the jersey and he told me he sole the jersey. now you writes me a printed letter and sez if i send you the munney you will send me the goods. i recon you will most enny durn fool ud do that. i would not mind a Bit sending in the munney and risk gittin the goods but when i recollect how you and yor eagent done me i refuse to do it if you would of treted me right and rit me letters in ritin and not of sent me that newspeper printed letter like I wuz a dam fool and could not read ritin i would a tuck the goods and pade the munny. now i dont wont no more of yore printed letters i wont stan sich from no house i am fifty six year ole the last of next comin jinuwary and the fust man has got to put my back on the ground yit. i may not have as much larnin in gramma as you got but i can whup you or enny uthr dam yanky that wants to try riting me a printed letter."

President William Livingstone, of the Lake Carriers' Association, returned from a five weeks' tour in Europe on Aug. 18.

PROPOSALS FOR DREDGING—U. S. Engineer office 813 Prospect Ave., S. E., Cleveland, Ohio, September 8, 1910. Sealed proposals for dredging Toledo harbor, Ohio, will be received at this office until 10 o'clock, A. M., October 8, 1910, and then publicly opened. Information on application. John Millis, Col., Engrs.

PROPOSALS FOR CONSTRUCTING Breakwater.—U. S. Engineer Office, 813 Prospect Ave., S. E., Cleveland, Ohio, September 8, 1910. Sealed proposals for constructing breakwater at Fairport, Ohio, will be received at this office until 10 o'clock, A. M., October 8, 1910, and then publicly opened. Information on application. John Millis, Col., Engrs.

PROPOSALS FOR REPAIRING BREAKWATER.—United States Engineer office, 813 Prospect avenue S. E., Cleveland, O., Sept. 9, 1910. Sealed proposals for repairing breakwater at Cleveland harbor, O., will be received at this office until 10 o'clock a. m., Oct. 15, 1910, and then publicly opened. Information on application. John Millis, Colonel Engineers.